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EDITORIAL.

Poultry Feeding.

An account is given in this number of experimental work which has been conducted at the School of Agriculture, Malaya, at Serdang, on the feeding of young chicks. We believe these experiments to be the first of their kind to be carried out in Malaya, and they thus mark a new and interesting departure in this field of investigation, besides providing a valuable contribution to our knowledge of this subject.

It is to be noted that the work was carried out in conjunction with training in general agriculture. Facilities for the conduct of research work are frequently provided in scholastic institutions and are of considerable value in that they impress upon students the necessity of careful observation and recording. In the present instance, the conduct of poultry investigations at the School of Agriculture carries with it the additional advantage of emphasising the scope which exists in Malaya for the extension of poultry husbandry to bridge the gap of about one million dollars annually between local production and the total consumption of poultry and eggs.

We have known a number of poultry-breeders in this country in the past who have relied almost entirely on imported poultry-food mixtures, and who claimed that their birds thrived on such foods. Foods mixed by commercial firms of repute are based on a knowledge of the nutritional requirements of poultry, and although the cost of imported foods in Malaya is high, they may be expected to possess advantages over many of the locally-devised rations, which not infrequently are ill-balanced in one respect or another. It is in respect of this matter of costs relative to efficiency that carefully-planned investigations with local rations assume a considerable degree of importance.

The experiments here recorded indicate that weight increase in young chicks can be considerably accelerated and made to approximate more closely to typical breed weights than was the case with rations previously advocated by this Department.

The author commences with a standard of weight increase of Rhode Island Reds from hatching to twelve weeks of age, which is accepted by poultry-breeders in temperate climates. As it was found impossible to attain this standard in Malaya with the rations usually adopted in the past, four new rations were drawn up and tested on chicks of this breed.

Too great reliance cannot be placed on the results of feeding with Ration C, as only one group of Rhode Islands was fed on this ration; Ration B gave better results than A, while Ration D was better than either A or B.

The fact that this work was conducted in conjunction with the school training prevented different batches of chicks being subjected to the experimental conditions simultaneously, and, therefore, rigid proof is not forthcoming. The probability is, however, that the results will be found to hold good in general practice.

The results indicate the desirability of including a comparatively high proportion of dried skim milk in the ration, and thus confirm, under Malayan conditions, results which have been obtained elsewhere. The author estimates that the cost of feeding a bird to 16 weeks, by which time it should weigh 3 lbs., would be about 80 cents. This may appear high, but it is cheaper than importing new pure-bred birds from abroad, and the quality of any surplus birds which were used for table purposes would be far superior to that of village-produced birds bought in the local markets.

The experiments were concerned only with the first twelve weeks of the life of the bird; the next step would appear to be to investigate rations suitable for poultry from this age until they come into lay or are ready for the table. It is to be hoped that, in spite of the limited facilities at the School, it may be found possible to pursue this subject in the near future.

Farm Schools.

In the last number of this Journal, an account was given of the annual prize distribution at the School of Agriculture, Malaya. In the course of his speech to the students, the Hon'ble Dr. H. A. Tempany, C.B.E., referred to "the coming into being of what may be termed the first child of the School in the shape of the Farm School at Malacca". He stated that it is hoped to open similar farm schools in Penang and Singapore and added:

> "If these ventures succeed, as I hope they will, there seems to be no reason why there should not ultimately arise a chain of Farm Schools extending throughout the Peninsula, with this institution (the School of Agriculture, Malaya) at the head of the chain."

In view of the development of farm schools throughout the country, visualized by Dr. Tempany, particular interest attaches to the article in this number dealing with the Farm School, Malacca. While it may be too early to gauge the ultimate effectiveness of the school, the venture appears distinctly promising as a means of stimulating rural life by improving the standard of agricultural practice amongst small-holders and in demonstrating in the most practical way the advantages of high-quality stock and improved planting material.

***Ustulina zonata* and Oil Palms.**

The fungus *Ustulina zonata* is well-known in Malaya and other tropical countries as a parasite capable of doing considerable damage to trees, *e.g.* rubber, tea, coffee.

This fungus has now made its appearance on the oil palm in Malaya and has been found on the roots, in association with a rotting of the roots and basal stem tissue, and on the stem, some feet above ground, causing a decay of the leaf bases left on the stem pruning.

In an article to be found on another page of this issue an account is given of the appearance of this fungus on the leaf base of a pruned oil palm leaf. Only one case of upper leaf base decay has so far been found, and in this instance the fungus had not penetrated into the stem tissue, so it cannot yet be stated that *U. zonata* actually can cause a form of stem rot of oil palms but, in view of the known parasitic nature of the fungus, it is not improbable that it may at any time in the future be recorded as capable of attacking the stem tissue above ground.

It is probable, however, that if this should occur the development of the fungus within the stem tissue would be slow and control measures should not be difficult.

Original Articles.

THE FOOD REQUIREMENTS OF YOUNG CHICKS

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Introduction.

Profitable poultry farming depends largely on the successful raising of young stock. The economic life of a hen seldom exceeds two years after coming into lay, and may be considerably less, for egg production usually declines by then to a level which is unremunerative unless the eggs are of special value for breeding purposes. The periodical replacement with young pullets of a proportion of laying hens must therefore be accepted as an essential part of sound poultry management; and, whether it is the farmer himself or a specialist who carries out the actual operations of hatching and weaning, poor growth in the early stages will have serious consequences. Not only will pullets in general fail to attain typical breed weight by the time they reach sexual maturity—resulting in small eggs, a more or less rapid decline in the intensity of laying once the first flush is over, and possibly also in heavy mortality through inability to stand up to the physical strain of laying, if the birds arrive at that stage—but surplus cockerels will take longer to reach a marketable weight, and the cost of housing and feeding them for a prolonged period may be prohibitive. The growth rate of young chicks thus provides a subject for careful observation; and, where unsatisfactory progress is recorded, investigations should be undertaken without delay to ascertain and, if possible, remove the limiting factor or factors which are in operation.

One should not necessarily begin, however, by assuming that it is the ration or the system of feeding which is at fault, for a number of factors may adversely influence the digestion and assimilation of food. Weak fertilization, faulty hatching or incubation, internal or external parasites, and particularly chills, resulting from exposure to draughts or damp, are the most likely sources of trouble in this country other than the food supply. The poultry farmer should first satisfy himself that they are not responsible before proceeding to blame the ration.

Local Growth Rate.

The author's interest was first attracted to this subject by the consistently poor growth rate of young chicks at the School of Agriculture, Serdang, where a few small flocks have been maintained for some time, mainly for instructional purposes. Systematic weight records were not kept at the School before February 1935, but groups of chicks had been weighed occasionally to obtain a rough idea of their progress, and even from these records it was obvious that matters were by no means satisfactory. Since then, average weights have been recorded weekly

for each group from the date of hatching up to the age of 12 weeks, even where two or more groups of the same age were run together for convenience in management. The majority of birds so handled have been pure-bred Rhode Island Reds, and the figures given in this article consequently refer mainly to this breed. Poor growth, however, has by no means been confined to Rhode Islands, but has been just as evident with Light Sussex and with various cross-bred and half-bred chicks.

It is not possible to lay down absolute standards of weight increase, but some idea of what Rhode Island chicks should weigh at ages up to 12 weeks can be gained from Table I. The figures are based on those given in Card and Henderson's text-book. (1).

Table I.

Average Weights of Pure-Bred R.I.R. Chicks.

Age	Weight	Age	Weight
0 weeks	1.3 ozs.	7 weeks	15.5 ozs.
1 „	1.8 „	8 „	19.7 „
2 „	2.6 „	9 „	25.0 „
3 „	4.0 „	10 „	30.2 „
4 „	5.8 „	11 „	34.0 „
5 „	8.5 „	12 „	36.7 „
6 „	11.8 „		

It will be observed that, according to these figures, Rhode Islands may be expected to reach an average weight of about 2¼ lbs. by the age of 12 weeks, and that the rate of growth, as indicated by weekly increments in weight, gradually increases from birth to a maximum at about the 9th or 10th week and subsequently declines somewhat. One must be careful, however, not to regard these averages as an invariable criterion of good progress. They refer to chicks raised under temperate, not tropical, conditions; little information is available as to the precise methods by which they were obtained, save that they represent observations from several farms over a period of three years and "indicate what may reasonably be expected under favourable conditions of feeding and management". There is no evidence, for example, as to whether the chicks were weighed with a full or an empty crop or whether, and if so to what extent, the young chicks were culled. For the purpose of investigations at the School, the practice has always been to weigh with the crop empty and to carry out no culling during the experimental period beyond what has been inevitable through malformation at birth or death within the first 12 weeks. Records obtained from a number of chicks shew that the average difference between a full and an empty crop at 12 weeks of age is

about 1¼ ozs., or nearly 5 per cent. of the desired body weight; while, with a group of 31 R.I.R chicks of that age averaging 31.5 ozs. in weight, individual weights ranged from 23.5 to 42 ozs. and—by culling to the extent of 20 per cent. by destroying the six lightest birds—the average weight would automatically have been raised to 35 ozs. Evidence is also forthcoming that, with certain animals at least, a strain that has been raised of European parents in the tropics is usually somewhat lighter than its temperate relations. It is therefore not unreasonable to assert that, so far as actual records are concerned, conditions at the School are not conducive to high figures; and, therefore, while it was hoped in the beginning to obtain weights which would at least equal those cited by Card and Henderson, it was felt that an average of not less than 32 ozs. at 12 weeks of age should be regarded as satisfactory.

Throughout the twelve months covered by these investigations, chicks have been hatched and reared both by the natural method and by a Hearson's incubator (50 egg size) followed by various types of outdoor brooder. The Rhode Island parent stock, which was imported from England as young birds in December 1933, has remained in reasonably good condition ever since, but the first generation offspring compares unfavourably in body weight and egg size, presumably as a result of failing to make satisfactory progress as chicks. No serious fault has been found with the management of hatching and weaning operations. With the exception of a few casualties, which may be regarded as more or less inevitable with young birds, the chicks have appeared to be reasonably healthy, both appetite and activity being good, and the records of chicks raised under broody hens have shewn no consistent differences from those raised artificially.

To begin with, a number of autopsies were conducted on 7-day-old chicks. These shewed that the yolk was completely absorbed by that time—in other words, that digestion was functioning normally immediately before and after birth. Enquiries at a number of sources throughout the country then elicited the information that poor growth rate was the rule rather than the exception, at any rate where chicks were raised intensively or semi-intensively; and that, wherever efforts were being made to feed scientifically balanced rations, the ingredients were more or less the same as those then in use at the School, but with small differences here and there in the proportions of the mixture. Again, when judging locally-bred fowls at the Malayan Exhibition in August, 1935, the author was impressed by the lack of weight in many of the exhibits, particularly the pullets. Few satisfactory claims have been received, in fact, and these have seldom been supported by actual figures. Two reports, however, are worthy of note in this place: one, that chicks hatched from eggs supplied by the School and fed on an imported chick meal supplemented by finely chopped boiled eggs reached an

average weight of 8 ozs. at 4 weeks and 19 ozs. at 8 weeks—the other, that chicks raised on Ration B (*vide infra*) but allowed free range almost from birth weighed nearly 6 ozs. at 3 weeks and 10 ozs. at 5 weeks of age.

Nutritional Value of Rations.

From the above considerations, it was concluded that the problem was essentially one of nutrition. Chicks at the School, and frequently elsewhere, can be allowed only limited range; and, even when free range is available, its value as providing access to a natural source of food such as seeds and insects probably varies between wide limits depending on soil texture and nature of cultivation. There is consequently a risk, even with free range, that chicks may pick up little in the way of "free" food and thus be largely dependent on artificial supplies.

Bearing in mind not only the above but also the fact that cereals and their by-products usually constitute from 50 to 75 per cent. of typical chick rations, the objective at the School has always been to devise a balanced ration suitable either for intensive or semi-intensive systems of management or as a supplementary ration where the extensive system is adopted, and composed as far as possible of locally grown or locally manufactured ingredients. Thus, the only cereals employed are padi and maize; but, in the absence of locally prepared white fish meal of first class quality, these cereals have had to be supplemented by imported animal proteins and, in the earlier experiments, by imported minerals as well.

Prior to February 1935, the food supply consisted of Ration A (*vide infra*), (2), together with succulent greenstuff such as fresh lettuce and *kangkong* leaves and fresh cows' milk which was first skimmed and diluted with an equal volume of water and then fed in the drinking vessels. The mash was soon changed to that of Ration B for reasons which have been indicated elsewhere (3), the main object being to secure a balance between proteins and carbohydrates more in accordance with standards advocated by Halnan (4) and other authorities; but the feeding of good greenstuff and liquid milk was continued.

The composition of Rations A and B is shewn in Table II, while Table III gives the corresponding average weights of chicks up to 12 weeks of age, by which time the young birds have been completely weaned from chick to "growers" rations. This weaning process at the School follows that which is commonly practised in England and other temperate countries, young birds receiving chick rations alone for the first 8 weeks of life, after which the change to the growers ration is effected gradually by feeding 3 parts of chick to 1 part of growers mash during the 9th week, equal parts of each during the 10th week, 1 part of chick to 3 parts of growers mash during the 11th week, and subsequently growers rations only until the pullets are approaching sexual maturity, when layers rations are introduced gradually in the same way. The same growers mash was employed

throughout these investigations; and, although it may be capable of improvement, indications at present are that it fulfils requirements reasonably well. Results obtained with the various chick rations which have been tested might have been discontinued at the end of the 8th week, but it was considered preferable to continue them up to the 12th week, by which time the use of chick mash had entirely ceased.

Table II.

Composition of Dry-Mash. Rations A and B.

(Parts by Weight).

Ingredients.	Ration A	Ration B
Padi, ground, husk discarded ...	11	40
Maize, yellow, ground ...	—	12
Bran, white cargo ...	—	20
Groundnut cake ...	4	11
Whale meat meal ...	4	12
Steamed bone flour ...	0.36	2½
Powdered limestone ...	0.12	1¾
Salt ...	0.12	⅝
Ferric oxide ...	—	⅛
Red palm oil ...	0.4	—
Supplying approximately ...	21.5 per cent.* D.P. and 78.0 per cent. S.E.	14.3 per cent. D.P. and 65 per cent. S.E.

* D.P. = Digestible Protein. S.E. = Starch Equivalent. (3)

The figures given in Table III are in each case the average weights of three groups, comprising a total of 14 chicks receiving Ration A and 22 chicks receiving Ration B. They indicate that the revised ration failed to effect any improvement in growth during the first 8 weeks of life, but that somewhat better progress was subsequently recorded by chicks raised on Ration B. Thus, at 12 weeks of age, this ration gave an average of 20.7 ozs. with Rhode Islands as against only 14.1 ozs. with Ration A.

If a typical Rhode Island chicken should weigh 2 to 2¼ lbs. at 12 weeks of age, 14 ozs. and 20 ozs. must be regarded as almost equally unsatisfactory. Opportunity was therefore taken of discussing the problem with Professor J. L. Rosedale of the College of Medicine, Singapore, and of surveying some of the available literature on the subject (5) to (10), in the light of which both rations

Table III.

Average Weight of R. I. R. Chicks fed on Rations A and B.

Age	Normal Averages	Actual Averages at Serdang	
		Ration A	Ration B
0 weeks	1.3 ozs.	—	1.3 ozs.
1 „	1.8 „	—	1.6 „
2 „	2.6 „	2.6 ozs. *	2.2 „
3 „	4.0 „	—	2.7 „
4 „	5.8 „	—	3.1 „
5 „	8.5 „	—	4.3 „
6 „	11.8 „	5.5 ozs. *	5.5 „
7 „	15.5 „	6.8 „ *	7.0 „
8 „	19.7 „	—	9.3 „
9 „	25.0 „	9.3 „	11.5 „
10 „	30.2 „	10.5 „	15.0 „
11 „	34.0 „	11.9 „	18.0 „
12 „	36.7 „	14.1 „	20.7 „

* = records prior to February, 1935.

were re-examined in detail under three main headings—proteins, minerals and vitamins.

In relation to the first of these, the main questions which arose were (i) the biological value of the proteins of these rations, (ii) the optimum proportion of good protein in a chick mash. Cereal proteins, especially those of rice, are poor both in quantity and quality, while those of animal and vegetable concentrates vary considerably. A mixture of concentrates should always be employed; but, whereas whale meat meal in combination with groundnut cake is satisfactory for laying hens, a wider variety is possibly needed for young chicks where growth is the primary objective. Analyses of whale meat meal and groundnut cake indicate that they are not deficient in the important amino-acids lysine and tryptophane, but other factors are almost certainly involved, the precise nature of which is not yet fully understood. One fact, however, is certain—that milk, and particularly dried skim milk, is one of if not the most efficient source of protein for young

animals in general. Reliable chick mashes in the British Isles usually contain up to 10 per cent. of dried milk unless the chicks can be given separated milk *ad lib.*

It was found at the School that chicks consumed very little liquid milk, either in the fresh condition or when artificially soured by the addition of rennet. Moreover, the labour required for cleaning drinking vessels used for milk presented difficulties. It was therefore decided to substitute dried skim milk for at least part of the existing protein-rich ingredients and to discontinue the feeding of liquid milk. By using a modest proportion of skim milk in the first place, it was anticipated that any serious deficiencies in the biological value of whale meat and groundnut cake proteins would be exposed.

Opinion seems to be divided as to the optimum proportion of good protein in a chick mash, some authorities recommending about 14 per cent. while others recommend as much as 18 per cent. It was therefore considered advisable not only to introduce skim milk but also to test the effect of increasing the protein content of the ration.

In relation to minerals, no deficiency was apparent in chicks raised on Rations A and B, where the size and shape of frame—as distinct from its weight—and the strength of the bones was satisfactory. Some variation must be expected even with good rations, and undersized birds are usually rigorously culled in commercial practice as soon as they are detected. Moreover, as dried skim milk is comparatively rich in calcium, there appeared to be little if any risk in substituting this for part of the whale meat meal.

The vitamin aspect of the problem was made clearer by reference to the work of Plimmer and his associates, as set forth in *The Biochemical Journal,* and that of Rosedale in this country. Thus, while 0.5 per cent. cod liver oil (or its equivalent) may be accepted as the minimum requirement of fowls for vitamin A, 2 per cent. appears to be the optimum proportion. Reference to Rosedale's figures (11) shews that 1 gram of yellow maize supplies only 6 vitamin A units as against 1,300 units per gram for cod liver oil and 1,200 for unbleached palm oil. In other words, a ration composed entirely of maize would just supply the minimal quantity of vitamin A; but such a diet would, of course, be completely unbalanced in every other respect. To make certain that the requirements for vitamin A are fully satisfied, it is therefore considered desirable that 2 to 3 per cent. red palm oil should be included in all balanced poultry rations in this country, at any rate where free range is not available. No evidence of vitamin A deficiency has actually been observed in young chicks raised exclusively at the School, even on Ration B; but it must be admitted that deficiency diseases may not manifest themselves for some considerable time and may even pass unnoticed when such matters as size of egg, fertility and hatchability are at stake.

Vitamin B_1 was supplied in both Rations A and B by the ground padi and also, in the latter case only, by the white cargo bran (*not* parboiled bran which,

owing to its method of manufacture, has lost most of its water-soluble vitamins). Uncertainty was, however, felt in relation to the vitamin B_2 complex, which plays an important part in growth. The main source of this had been "good" greenstuff; but the vitamin B_2 content of greenstuff is extremely variable, and even *kangkong* and lettuce alone might fail to supply enough for a rapidly growing chick. Rosedale's figures (11) now enable one to check the vitamin B content of a ration with fair accuracy so far as those ingredients are concerned which are employed in the diet of human beings. Thus, if yeast is regarded as having a vitamin B value of 100, the requirements of adult chickens are estimated to have a value of 6, while those of young chicks require somewhat more (8 to 10) to balance the increased proportion of proteins. On this basis, Rations A and B appear to have a value of about 5 and 9 respectively. It was anticipated that dried skim milk would help to remedy any deficiency that may have existed, but that recourse to further supplies might prove to be advisable in the form of unextracted dried yeast (*not* extracted yeast, which has yielded up most of its vitamin B in the manufacture of preparations such as Marmite).

The conclusions drawn were thus that both Rations A and B were lacking in biologically good proteins, that Ration A was also deficient in vitamin B, and that Ration B was deficient in vitamin A. A series of feeding trials was therefore drawn up in which these factors could be examined first singly and then in combination. For the first of these trials, Ration C was devised. This was similar to Ration B but included 8 per cent. dried skim milk at the expense of bran, whale meat meal and groundnut cake which were reduced to 15, 10 and 10 per cent. respectively. This mash, with a slightly higher proportion of protein than that of Ration B, was fed *ad lib.* together with the usual allowance of good greenstuff but without liquid milk. The results obtained from three groups of chicks are recorded in Table IV, normal averages being repeated for comparison. The figures are interesting as they appear to demonstrate two facts:—

(*a*) the incorporation of only 8 per cent. dried skim milk in the ration, with a slight reduction in the whale meat meal and groundnut cake and the exclusion of liquid milk, effected no improvement in growth rate during the first 6 or 7 weeks;

(*b*) chicks fed on this mash then shewed a sudden and conspicuous improvement, so that—although subsequent progress did not altogether come up to expectations—they definitely weighed more than chicks raised on Rations A or B.

On examining the subsequent history of those chickens which had received Rations A and B, indications were observed that there was frequently, but not invariably, a pronounced increase in weight at one stage or another. With Ration A, this jump took place—when it did occur—during the fifth month, while with Ration B it tended to occur somewhat earlier. Ration C produced an appreciable jump in three successive tests at a much earlier age, about the seventh week. It is interesting to note that a similar jump was experienced in the original records

Table IV.

Average Weights of Chicks fed on Ration C.

Age	Normal Averages	Actual Averages at Serdang		
		Lt. Sussex x R.I.R. (12 chicks)	R.I.R. (5 chicks)	R.I.R. x Native (8 chicks)
0 weeks	1.3 ozs.	1.3 ozs.	1.4 ozs.	1.1 ozs.
1 „	1.8 „	1.6 „	1.6 „	1.2 „
2 „	2.6 „	2.1 „	2.1 „	1.6 „
3 „	4.0 „	3.1 „	2.9 „	2.6 „
4 „	5.8 „	3.7 „	3.9 „	3.1 „
5 „	8.5 „	4.7 „	5.5 „	4.0 „
6 „	11.8 „	5.9 „	7.6 „	5.5 „
7 „	15.5 „	8.8 „	10.5 „	10.0 „
8 „	19.7 „	11.8 „	12.7 „	11.0 „
9 „	25.0 „	14.7 „	16.7 „	13.0 „
10 „	30.2 „	17.8 „	18.3 „	16.0 „
11 „	34.0 „	20.2 „	22.3 „	22.0 „
12 „	36.7 „	23.0 „	26.6 „	25.0 „

of Plimmer and Rosedale (5), and it is probably a by no means unusual occurrence in young animals generally, although the precise reasons for it are not clear. So far as chickens are concerned, however, it is desirable that—if such jumps must occur—they should do so as early as possible, particularly where table birds are concerned—but that they should not be too pronounced as they might encourage the development of leg weakness if bone formation failed to make equal progress.

The fact remains that the inclusion in the mash of only 8 per cent. dried skim milk had effected no material improvement during the first 6 weeks and had subsequently not led to the attainment of normal weights, although some advance had been made in this direction as is seen by comparing weights at 12 weeks of age. The next step in the investigation appeared to lie in increasing the proportion of dried skim milk.

Experimental Rations.

By this time, however, the problem assumed a much greater degree of local importance. Reports of poor growth were constantly being received, while the demand for good stock and for reliable advice on feeding had expanded considerably. It would have been preferable to have been able to continue the original policy of examining the effect of each factor separately before testing

them in combination; but, with the limited facilities for such work which are at present available at the School, a considerable time would have elapsed before final conclusions could be drawn. It therefore seemed advisable to change the earlier procedure and, in the light of experience, to aim at devising a mash which would satisfy all the known or anticipated requirements. Provided that such a mash gave satisfactory results, further experiments might subsequently be undertaken with a view to eliminating any superfluous ingredient. Ration D, containing not only a high proportion of dried skim milk but also dried yeast and palm oil, was therefore introduced about the end of September 1935. A proportion of whale meat meal was still retained in the ration in order to maintain a narrow protein ratio; but steamed bone flour, powdered limestone and iron oxide were omitted as the ration was considered to supply sufficient minerals without them.

RATION D.

		parts.
Padi, ground, husk discarded	...	20
Maize, yellow, ground	...	20
Bran, white cargo	...	24
Dried skim milk	...	20
Whale meat meal	...	10
Yeast, dried, unextracted	...	3
Salt	...	1
Red palm oil	...	2
		100

(Supplying approximately 17.5 per cent. D.P. and 64.5 per cent. S.E.).

In addition to its high protein content, Ration D has a vitamin B value of 11 while the vitamin A content is equivalent to over 1.9 per cent. of cod liver oil.

The results obtained with this mash are shewn in Table V.

These records shew that progress was excellent for the first 6 to 7 weeks, but that increments then fell behind those recorded by Card and Henderson and left an average deficit at 12 weeks ranging from 5.7 ozs. (about 15 per cent.) in the case of Rhode Islands to 3.4 ozs. (about 10 per cent.) in the case of the R.I.R. x Native cross, where hybrid vigour appears to have played a considerable part. The figures for Light Sussex at 12 weeks of age should not be regarded as significantly better than those of Rhode Islands or cross-breds as only 5 birds were involved. In the case of the Rhode Islands it may be mentioned that one group of 5 chicks included in these figures, which had been hatched and raised under a broody hen, averaged only 25.3 ozs. at 12 weeks, as against 32.3 ozs., 30.7 ozs. and 31.5 ozs. respectively for the remaining three groups which were hatched and raised artificially.

As stated earlier, it is considered that weights over 32 ozs. at 12 weeks of age should be regarded as reasonably satisfactory. Had the group which averaged

Table V.
Average Weights of Chicks fed on Ration D.

Age	Normal Average	Actual Averages at Serdang.		
		R. I. R. (53 chicks)	l.t. Sussex (5 chicks)	R.I.R. x Native (37 chicks)
0 weeks	1.3 ozs.	1.4 ozs.	1.3 ozs.	1.2 ozs.
1 „	1.8 „	2.1 „	2.2 „	1.8 „
2 „	2.6 „	3.4 „	3.8 „	3.1 „
3 „	4.0 „	5.1 „	5.8 „	4.5 „
4 „	5.8 „	7.1 „	7.0 „	6.5 „
5 „	8.5 „	9.6 „	11.2 „	9.4 „
6 „	11.8 „	12.3 „	14.4 „	12.5 „
7 „	15.5 „	15.6 „	15.3 „	15.5 „
8 „	19.7 „	17.6 „	18.0 „	18.4 „
9 „	25.0 „	20.9 „	21.6 „	22.2 „
10 „	30.2 „	24.6 „	27.3 „	25.9 „
11 „	34.0 „	27.8 „	31.0 „	29.7 „
12 „	36.7 „	31.0 „	35.6 „	33.3 „

31.5 ozs. at 12 weeks been culled to the extent of 20 per cent. and weighed in the evening when the crop was full, the average would have been 36.7 ozs.—equal to that of Card and Henderson. At the same time, the fact that average weights were perfectly satisfactory up to the sixth or seventh week but than fell off suddenly appears to indicate that another factor may be involved. Two such factors have been suggested—minerals and climate. The first of these was tested by raising a few groups of chicks on a modified Ration D in which 2 per cent. powdered oyster shell was included at the expense of bran. The results obtained with a group of 13 Light Sussex chicks, for example, were 12.3 ozs. at 6 weeks, 15.1 ozs. at 7 weeks, 18.5 ozs. at 8 weeks, and 34.4 ozs. at 12 weeks of age, shewing the same falling off at about the same age, and from these figures it is concluded that the inclusion of additional calcium had no effect on growth rate. It may, however, be observed that Ration D contains only about 1.5 per cent. of calcium oxide, as against 2.5 per cent. when oyster shell was added, and that the latter figure is more in accordance with Halnan's recommendations. The extra minerals may therefore be advisable, but they cannot be definitely regarded as necessary. The only amendment to Ration D which is at present recommended is to increase the palm oil to 3 per cent., thus making quite certain that vitamin A is fully supplied.

The Climatic Factor.

The possibility of a climatic factor has not yet been fully investigated. It appears possible that in the tropics, where development in certain physical respects is commonly earlier than in the temperate zones, the necessity for a high protein content in the ration does not extend over the whole of the period covered by these investigations, and it may be desirable to wean young chicks from chick mash somewhat earlier than has been the practice at the School. It is therefore proposed to test the effect of starting weaning before the ninth week. The results of these further investigations will be published in due course.

Economics.

In conclusion, a few remarks on certain economic aspects of the subject may not be out of place. Excluding transport charges from local dealers and the cost of labour for grinding and mixing, the cost of Ration D at the School is 5.8 cents per lb., as against 3.6, 3.0 and 4.0 cents for Rations A, B and C respectively and 2.5 cents for growers mash. Provided that the major ingredients are purchased in lots of at least 1 cwt., the all-in cost of Ration D should not exceed 8 cents and growers mash 4 cents a lb., but these figures would be considerably higher if supplies were purchased in small quantities at a time.

It is estimated that a heavy breed chick consumes about 4 lbs. of food during the first 8 weeks of life, 4 lbs. during the next month, and 6 lbs. the following month. Excluding waste, the extent of which cannot be discussed in detail in this place but depends mainly on the type of mash trough and system of feeding employed (wet mash being more economical than dry where sparrows are numerous), it should not cost more than 32 cents to feed a chick up to the eighth week and 23 cents for the next month while changing over to growers mash, so long as chicks are raised on a farm scale. For mere backyard operations, however, these costs would be higher, as explained above. Under existing *kampong* conditions, rations such as these would be uneconomic; but, for chicks which will develop into good laying hens or breeding cockerels, the above estimate cannot be regarded as high in Malaya, where imported rations are even more expensive. For the farm scale production of table birds, feeding costs to 16 weeks of age would be about 80 cents and the birds should then average about 3 lbs. each. Such fowls might not compete directly with *kampong* table birds in the ordinary local markets, where there are usually ample supplies of table birds scaling $2\frac{1}{2}$ to 3 lbs. live weight and selling at 50 to 60 cents each; but the quality of market fowls at this price leaves much to be desired, particularly in respect of tenderness, succulence and proportion of meat to bone, and it is by no means impossible that table birds raised on a milk-rich diet such as Ration D would soon command a special market of their own, with correspondingly high prices, as in fact already occurs with local capons. Under backyard conditions, a 16 weeks bird would probably cost the owner $1.50 in food, if fed on these rations alone, but this could be considerably reduced by the use of household scraps after the weaning stage

If large scale poultry farmers existed in this country, they would naturally purchase foodstuffs in bulk, either buying each ingredient separately in the cheapest available market and carrying out grinding and mixing operations with their own labour, or purchasing mixed rations (if available at reasonable prices) in quantities which could be stored for a convenient length of time, which would depend upon the risk of deterioration. Ground cereals rapidly become infested with pests in this country unless they are stored carefully in a dry place. For the purchaser of small quantities of say 7 or 14 lbs. at a time, it should be possible to market a mash in sealed air-tight tins thereby avoiding not only damp but the possibility of adulteration. In this form, a 7 lb. tin of Ration D could probably be retailed at about $1.00. A useful alternative for both small and bulk supplies would lie in marketing the mash without its cereals and bran in the form of a "concentrate" to which the poultry keeper would add ground padi and bran, with or without maize, in accordance with instructions supplied with the container. Marketed in either of these forms, Ration D should overcome the legal difficulties which at present restrict the sale of dried skim milk in this country, and should go far towards solving what is at present a serious problem in the improvement of the existing standard of poultry husbandry.

Summary.

Attention is drawn to the unsatisfactory growth of young chicks which is commonly experienced in Malaya.

The average weights of young chicks from birth to 12 weeks of age, fed on four different rations, are recorded and compared. They indicate that a comparatively high proportion of milk in the ration is desirable if satisfactory growth is to be secured. Thus, a ration containing 20 per cent. dried skim milk gave average weights with Rhode Island Reds of 31.0 ozs. at 12 weeks, as compared with 14.1, 20.7 and 26.6 ozs. for other rations and an expectation of 36.7 ozs. in a temperate climate.

Average weights at the School could be raised to normal if chicks were culled more rigorously and if they were weighed with a full crop. There is, however, evidence that some other factor, so far undetermined but possibly climatic, is involved.

Acknowledgments.

The author wishes to express his indebtedness to Professor Rosedale for his kindly interest and help. He also has to acknowledge the assistance rendered in these investigations by those members of his staff and students who have been responsible for preparing and feeding the rations and for recording the figures on which this article is based.

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USTULINA ZONATA ON THE OIL PALM

BY
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Mycologist.

Ustulina on the Roots.

In 1933 a disease affecting the roots and the internal tissue at the base of the stem of oil palms was recorded from two localities in the Federated Malay States.

On one estate, on a lateritic soil, the base of the stems of some four-year old palms was found to be decayed internally with a black, dry rot which gave a charred appearance to the tissue, and had extended up the stem for not more than 18 inches. Many of the roots at the base were disintegrated, and since the lower leaf bases *i.e.* portions of the leaf stalks which remain attached to the stem when the leaves are pruned, were healthy it was considered that the rot had probably entered originally *via* the roots. A fungus was obtained in culture from the margin of the decay in the stem, but no spores or fructification developed and this fungus has not been identified. An orange-yellow pigment appeared in the medium when the fungus was grown on maize-meal agar.

The older leaves of these palms were affected by an abnormal yellowing and withering and it was observed that the majority, but not all, of the palms so affected were those whose growth had clearly been less vigorous than that of their neighbours. The disease was not confined to any one situation, and its incidence bore no apparent relation to local variations in soil type, neither was there any evidence of the presence of a hard pan.

This disease has been referred to as "Charcoal base-rot". (1)

From another estate in the same year a specimen of decayed basal stem tissue of a young oil palm was received. The charred appearance of the tissue suggested that the above-mentioned disease was present.

In 1934 a report was received from this estate that a palm exhibiting base rot had fallen over and the opportunity was taken to examine the palm *in situ*.

The palm was approximately four years old; the lower leaves had turned yellow, but otherwise growth appeared to have been normally vigorous.

The leaf-bases were sound but the bole of the palm below ground was decayed on one side with a greyish-brown, rather dry rot, and all the lower roots on this side were similarly affected. The rot had extended slightly up the centre of the stem, and about a quarter of an inch behind the margin of this rot there was a black, irregular line. In the case of the more recently formed roots situated near the margin of the decay, just below soil level, the decay was extending outwards into some of the roots.

No fungus fructifications were found on the palm, and cultures set up from the margin of the decayed tissue in the stem produced nothing but saprophytic moulds. Cultures taken from the margin of the decay in the roots, into which

the rot had extended outwards, produced mycelial growth similar to the growth obtained in culture from isolations taken from rubber wood attacked by *Ustulina zonata*.

The palm had been planted in close proximity to a buttressed jungle stump on which, however, no signs of Ustulina were detected. Adjacent palms were inspected but were found to be healthy, and no further cases of this root disease have since been reported. The charred or "charcoal" appearance of the tissue observed in 1933 was not prominent in this instance which possibly represented an earlier stage of "Charcoal base-rot" in which blackening of the affected tissue had not yet occurred.

Ustulina on the Stem.

When the leaves of an oil palm are pruned the leaf bases may harden and remain attached to the stem for many years, or they may begin to decay mainly as a result of the growth of fungi within the tissue. The fungi enter *via* the sloped pruning cut or through other wounds, and according to the nature of the fungus, weather conditions, the vigour of the palm, and the presence of termites, weevils or other insects, decay may extend as far as the stem or into the stem, or may extend only a short distance into the leaf base tissue.

Up to the present, in Malaya, only two fungi have been found capable of penetrating from the decaying leaf bases into the stem tissue of oil palms and to cause a disintegration of the stem, resulting in the death of a palm (1) and (2). These fungi are *Fomes noxius* (which also causes "brown-root" disease of the rubber tree, tea and coffee), and *Ganoderma lucidum* which sometimes attacks the roots of backward coconut palms.

In February 1936, while inspecting some palms on the estate where Ustulina had formerly been recorded on the roots of a palm, an unusual type of leaf base decay, which had not penetrated into the stem tissue, was observed on one palm at about 5 feet from the ground. *Ustulina zonata* was identified as the cause of the decay.

Symptoms.—The palm on which the fungus was recorded was approximately 7 years old, growing on the slope of a hill in an undulating area of quartzite soil. The stem was well-developed and the leaves were of a good green colour. Many of the old leaf bases were in varying stages of decay chiefly as a result of the growth of the fungus *Poria Ravenalae*—a saprophyte—within the tissue. On the side of the palm facing north-east, however, an unusual type of decay involving ten leaf bases was observed. On cutting through one of these leaf bases the tissue was found to be rather dry, tindery, dull tawny olive in colour and was permeated at the bottom with black lines which surrounded "islands" of tissue of a lighter colour (in some cases of a darker colour), than the remainder of the tissue.

The affected leaf bases were in contact with each other, and when they were all cut away down to the junction with the stem, a decayed patch about two feet square was exposed. The colour of the decayed tissue was similar to the decay

in the leaf bases and the black lines were prominent. The stem tissue above and below the decayed patch was healthy.

The Fungus.—Fructifications of *Ustulina zonata* were present in the perithecial stage on four of the decayed leaf bases. (See illustration). The conidial stage of the fungus was not found on the leaf bases; this is the first stage formed on the fructification which appears on the surface of diseased material in the form of a yellowish-white soft plate turning to greyish-white when about 1½ or 2 inches in diameter; it is about 1/10th inch thick. When the conidia, or first spores, are formed on the surface, the plate darkens to a greenish-grey colour. Later, furrows, more or less concentrically arranged, develop, the colour darkens to purple grey, and the plate becomes leathery in consistency, and dotted with numerous tiny black spots. These spots are the openings of the perithecia (sac-like structures embedded in the tissue of the plate in which the second spore form—the ascospores —are produced). Finally the fructification becomes black and brittle and by this time a number of plates may have fused together forming a large irregular plate.

[It should be mentioned here that the fungus *Poria Ravenalae*, which is harmless, is perhaps the commonest fungus on oil palm leaf bases. It also forms a greyish plate on the surface of the leaf bases but it can be distinguished from *Ustulina zonata*, easily, on examination.

Poria Ravenalae grows as a very thin, unfurrowed, grey skin which can be scraped away, and the surface is composed of minute pores which cannot be seen distinctly with the naked eye. *U. zonata* is much thicker, and its surface is furrowed and not porous.]

The Effect of the Fungus on the Stem.—The decay had not penetrated noticeably into the stem tissue, but apparently had stopped at the point where the leaf bases merged with the stem. The fungus appeared to have entered through one or two of the leaf bases and to have extended laterally, on reaching the stem tissue, into the adjoining leaf bases and then extended upwards and outwards in these leaf bases and formed fructifications instead of penetrating further into the stem.

Remarks.—This lateral extension has also been noticed in the case of stem rot caused by *Fomes noxius*, (which belongs to a different group of fungi) but *Fomes noxius*, as a rule, penetrates into the stem tissue for a short distance (about ½ inch) and then extends laterally, in the outer stem tissue as well as outwards in the adjacent leaf bases, before penetrating deeper into the stem, and fructifications are not formed until inward penetration is well advanced.

In view of the fact that, although considerable lateral extension of *U. zonata* had occurred in the tissue at the stem, no penetration of the stem was observed, it is possible that Ustulina may not function as a stem parasite of the oil palm, and it may be found that on the stems it is no more dangerous a fungus than *Poria Ravenalae*. *Ustulina zonata*, however, is a parasite of rubber, tea, coffee and other trees, and if not checked on these hosts it can extend in a plantation and do considerable damage, and the fact that it has now been recorded in

Fructifications of *Ustulina zonata* on a Leaf Base of an Oil Palm

association with a root disease and as a potential wound parasite of the stems of oil palms merits attention although, as yet, evidence of actual penetration into the stem tissue, *via* the leaf bases above ground, is lacking.

It would be unwise to draw conclusions from this isolated instance, until the parasitic possibilities of the fungus are tested further on the oil palm.

Pure cultures of the fungus have been prepared from material collected from the affected palm, and the fact that the mycelium in the tissue at the stem was alive has been determined by the isolation of the fungus from the tissue at this point. It is intended to carry out inoculation experiments with these cultures and with spores from fructifications, but if the fungus grows slowly in the non-woody tissue of the oil palm these experiments may be inconclusive.

It is hoped, therefore, that managers of oil palm estates will communicate with the writer if they observe the fungus on the roots or stems of oil palms on their estates, so that information as to its status as a parasite can be collected more rapidly.

With regard to Ustulina on the roots of oil palms, the evidence obtained to date indicates that, under certain conditions, the fungus is probably a parasite of the roots of the oil palm, but until further cases have been observed it is not possible to make a definite statement on this point.

Portions of a palm suffering from root disease, and from which Ustulina was isolated, were buried in close contact with the roots and base of the stem of a healthy oil palm but the inoculating material decayed away and the healthy palm did not become infected. Despite this single negative result, however, it would appear to be unwise to dispose of palm tissue, affected by Ustulina, by burying it in an oil palm area. [In the case of palms affected with stem-rot caused by *Fomes noxius*, burying the dead palms *in situ* disposes of the risk of spore infection from fructifications produced on the stem, and up to the present no cases of root disease have occurred as a result of this practice.]

Until more is known about the conditions likely to favour root or stem infection of oil palms by Ustulina, disposal, by burning, of leaf bases or tissue attacked by Ustulina is recommended in place of burying. Burning should be as complete as possible so as to prevent the formation of fructifications.

Summary.

1. A disease of oil palms affecting the roots and basal stem tissue, and referred to as "Charcoal base-rot", is described.
2. The association of the fungus *Ustulina zonata* with a somewhat similar disease is recorded.
3. A case of leaf base decay of an oil palm, caused by *Ustulina zonata*, is reported, and, although the stem tissue was not affected, it is considered desirable to investigate further the parasitic status of Ustulina on oil palms, in view of its known parasitic habit on other hosts.
4. The potential danger of burying diseased material affected by Ustulina is indicated.

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THE FARM SCHOOL, MALACCA

BY
R. G. HEATH,
Agricultural Officer, Malacca.

The proposal to institute, in Malacca, a system of vocational training in agriculture through the medium of a Farm School was submitted to Government, by the Director of Agriculture, Straits Settlements, and Adviser on Agriculture, Malay States, early in 1934. The original idea, which emanated from the Inspector of Schools, Malacca, was for a combined Technical and Agricultural School in Malacca town.

In forwarding his proposals, including the scheme for the Farm School, the Director mentioned that the School would in no way constitute a replacement of the facilities already in existence at the School of Agriculture, Malaya, by virtue of the fact that the instruction to be provided in Malacca would be of a more elementary nature as compared with that conveyed in the courses at Serdang, while, in addition, the cost of maintaining pupils at Serdang and the fact that the total accommodation there was limited to 80 pupils, restricted the capacity of that institution to deal with the problem of agricultural education in Malaya as a whole.

It was also mentioned that the project constituted a further step in the general policy of agricultural development as outlined in the Re-organization Proposals for the Department of Agriculture, prepared in 1930.

The proposals received the favourable consideration of Government and funds were made available, early in 1935, for the provision of the necessary buildings and equipment for the School. Work on the erection of the buildings commenced about the middle of the year and was completed in time to allow of the opening of the School on the 2nd September, 1935.

Objects of the School.

The major object of the School is the improvement of native agriculture in the Settlement. To this end, a course is provided which covers the principles and practice of agriculture, with special reference to local conditions, being designed primarily with a view to providing suitable training for boys whose future lies in the working of their own and their parents' holdings.

Situation.

The School is situated at the Sungei Udang Agricultural Station, some 13 miles from Malacca town, along the Mesjid Tanah road. The multiplicity of crops, both annual and perennial, under cultivation at this 23 acre Station, provide wide scope for practical instruction.

Buildings and Equipment.

The school buildings comprise quarters for the officer-in-charge, a class room, with a small room attached which can be used either as a mess-room or as an office, and bath and changing rooms. All are wooden structures of a semi-permanent nature. The class room is designed to provide accommodation for 25 pupils.

The equipment is of a simple nature and comprises desks, blackboards, a laboratory bench and cupboards. A certain amount of laboratory equipment is provided for the purpose of practical work of an elementary scientific nature, while the necessary tools for the carrying out of field work are also available.

Staff.

The School and the adjoining Agricultural Station are both under the charge of a Malay Instructor of the rank of Agricultural Assistant, Grade II, in the Department. The present Instructor is an officer whose previous experience includes four years service as a Junior Lecturer at the School of Agriculture, Malaya.

The School is under the direct control of the Agricultural Officer, Malacca, who makes frequent visits of inspection and supervises the general lines of the instruction given.

In order to ensure proper co-ordination of the work in Malacca with agricultural education at Serdang, occasional visits are made by the Principal, School of Agriculture, Malaya, in an advisory capacity.

Qualifications for Admission.

The School is, at present, non-residential. This entails that pupils who reside at a distance and are unable to return daily to their homes have, of necessity, to make their own arrangements regarding board and lodging in Sungei Udang or other near-by villages.

Admission is open to candidates of all nationalities, but a good knowledge of the Malay language is essential as the course is conducted in that language.

Candidates for admission must be not less than 15 years of age and must have passed either the highest standard in a vernacular (Malay) school or at least Standard V in an English school.

Tuition fees are payable at the rate of $3 per term ($9 per annum).

A number of scholarships, involving the remission of tuition fees only, are awarded annually, on the results of a competitive, written examination and an enquiry into the circumstances of the candidate, preference being given to those whose parents or guardians are the cultivators of land within the Settlement, on which it is their intention that the candidate shall find employment on the conclusion of his studies.

Curriculum.

The school year normally commences shortly after the termination of the Mohammedan fasting month and ends just prior to the commencement of the next

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School Buildings, The Farm School, Malacca

Students' Individual Plots, The Farm School, Malacca

fasting month. It consists of three terms, each of approximately 13 weeks duration, separated by two vacations of 3 weeks each.

The hours of work are from 7.30 a.m. to 1 p.m. daily, except on Fridays and Saturdays when the School closes at noon. This allows 23 hours of work in each week, of which 15 hours are devoted to field work, which is engaged in from 7.30 a.m. to 10. a.m. daily. There is an interval from 10 a.m. to 11.30 a.m. daily except on Fridays and Saturdays when it terminates at 11 a.m.

The summaries which follow give a broad outline of the scope of the course and the nature and extent of the class and field work.

Summary of Class Work.

		Hours Weekly.
(1).	Principles of agriculture ...	2¼
(2).	Field crops ...	2¼
(3).	Animal and poultry husbandry ...	1
(4).	Arithmetic ...	1
(5).	Economics ...	¾
(6).	General ...	¾
	Total ...	8

Summary of Field Work.

(1). Collective work on adjoining Agricultural Station.

(2). Individual plots for the cultivation of annual crops (1/60th acre per pupil).

(3). Demonstrations, experiments and practical work on subjects arising from lectures.

The teaching in class is rendered as simple as possible, having regard to the type of education required by pupils whose future lies in small-holding agriculture. In this respect, the Farm School course differs materially from the lower of the two courses at the School of Agriculture, Malaya.

Permanent and semi-permanent crops under cultivation on the Agricultural Station and available for collective work by the pupils of the School include tea, coffee, various types of local fruits, citrus, arecanuts, gambier, pepper, kapok, cloves, nutmegs, rubber, pineapples, tuba, Manila hemp, bananas, sugar cane and papaya. In addition, there are a number of annual crops under more or less continual cultivation including padi, maize, tobacco, turmeric, ginger, groundnuts, gingelly, tapioca and sweet potatoes together with numerous vegetable, green manure and cover crops and fodder and pasture grasses.

Progress of School.

The School made a very successful start, with a full complement of 25 pupils, of whom five are the holders of scholarships, awarded following an examination.

All the entrants are Malays and each of the three Administrative Districts of the Settlement is represented. Alor Gajah District has the largest representation, which is only to be expected having regard to the situation of the School.

The success attained in recruiting a full complement of pupils for the opening year is to be attributed to suitable advertising, by means of circulars in the Jawi character distributed to all headmen and vernacular schools throughout the Settlement, and through the medium of the local press. In addition, prior to the inception of the School, the Instructor made a tour of the Settlement for the purpose of addressing local audiences on the objects and mode of working of the School.

The general progress since opening has been excellent, the majority of the pupils having shown commendable keeness in their work.

A number of additions have been made, of late, to the equipment. These include the provision of a rubber smoke cabinet, a rubber manufacturing shed and a copra kiln, all suitable for adoption by native agriculturists. In addition, a flock of poultry of native breeds, together with the appropriate houses and other accessories, are being provided for instruction purposes in poultry husbandry. As the rubber planted on the Agricultural Station is, as yet, far from mature, instruction in tapping is conducted on an adjacent, privately-owned, holding.

It has been obvious for some time that the school would function better if it were residential. The system whereby those pupils who come from a distance have to make their own arrangements regarding board and lodging does not work well in practice, and, if the School is to continue to draw pupils from all parts of the Settlement, which is desirable, some other arrangements may well have to be made. The provision of hostel accommodation appears to be the only way of overcoming this difficulty.

To conclude, the ability of the School to fulfil its major object is a matter which only the future can prove. Touch must be maintained with the first batch of pupils, who will complete their course of training in November of this year, after they have returned to their respective homes, in order to ascertain whether or not they are fulfilling the object of their training, and so on with subsequent batches. In the matter of recruitment for the School year of 1937, upwards of one dozen applications have already been received, which may be regarded as satisfactory.

Received for publication 22nd March, 1936.

CONDITIONS ON RUBBER SMALL HOLDINGS IN MALAYA.

1st Quarter, 1936.

Prepared by the Economic Branch of the Department of Agriculture, S.S. and F.M.S., in collaboration with the Field Branch of the Department.

Rainfall.

The quarter under review was exceptional for the hot, dry weather experienced during February in nearly all parts of the Peninsula. January and March were extremely wet almost without exception, but in some districts the dry weather of February was extended to the first half of March.

Prices.

In common with the market rise in price of rubber, prices for small-holders' rubber steadily increased and, in March, reached $35 per picul in one district. The difference between smoked and unsmoked sheet was, at many centres, extremely small, and particularly noticeable were the relatively high prices paid for scrap.

Table I shews the range of prices paid for small-holders' rubber at several centres in each State or Settlement, and Table II gives the means of the range.

Production.

Production of rubber on small holdings during the first quarter of 1936 is given in Table III together with the relative figures for 1935. This table is compiled from the monthly report of stocks, imports and exports of rubber published by the Registrar-General of Statistics, S.S. and F.M.S.

Tapping.

Table IV summarizes the results of the quarterly survey of small holdings out of tapping. The estimates are obtained by counting the number of such holdings, and applying the percentage to the total area of small holdings in the District.

There was a still further increase in the acreage out of tapping during the quarter under review. The comparative figures are as follows:—Federated Malay States: December 1935, 203,900 acres (38 per cent.), March 1936, 219,300 acres (41 per cent.); Straits Settlements: December 1935, 33,100 acres (28.4 per cent.), March 1936, 39,400 acres (33.8 per cent.).

The acreage estimated to be out of tapping at the end of March 1935 was as follows:—Federated Malay States 93,100 acres (17.5 per cent.); Straits Settlements 17,900 acres (15.4 per cent.).

The area out of tapping on small holdings in the State of Johore at the end of March was estimated to be 43 per cent. or 138,600 acres, as compared with

Table I.

Lowest and Highest Rubber Prices Paid by Local Rubber Dealers.

(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1936.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
			JANUARY					
Smoked sheet	29.00-31.50	25.00-30.80	25.00-31.00	26.00-31.00	26.00-32.90	29.00-33.50	28.00-33.20	26.00-31.50
Unsmoked sheet	28.00-31.00	22.00-30.00	22.00-28.00	25.00-30.00	23.00-29.50	27.50-31.75	26.00-32.30	24.00-30.00
Scrap	19.00-25.00	—	23.00-27.00	20.00-27.00	—	24.00-29.00	20.00-27.00	23.50-27.50
			FEBRUARY					
Smoked sheet	31.20-34.50	28.00-33.80	26.00-33.35	30.00-33.30	27.00-33.20	32.00-33.50	30.00-33.50	29.80-33.80
Unsmoked sheet	30.00-33.80	26.70-33.50	26.00-31.50	26.00-32.00	24.50-31.70	30.50-32.00	30.00-32.40	28.00-32.60
Scrap	24.00-28.50	26.00	26.00-28.00	25.00-28.00	—	27.00-28.50	26.50-28.00	25.00-30.00
			MARCH					
Smoked sheet	32.50-35.00	30.50-33.80	28.00-33.60	30.00-33.50	28.00-33.40	32.00-34.00	32.60-34.00	28.50-33.50
Unsmoked sheet	31.00-34.00	29.00-32.80	24.00-32.20	29.00-33.00	29.00-32.00	30.00-32.50	31.00-33.00	28.00-33.00
Scrap	25.00-28.75	28.00	26.00-29.00	25.00-28.00	—	28.00-31.00	26.50-29.00	27.00-30.00

Table II.

Mean of Lowest and Highest Rubber Prices Paid by Local Dealers at a number of Centres in each State.

(In Straits dollars per picul (133 1/3 lbs.))

1st Quarter 1936.

	Penang	Perak	Selangor	Negri Sembilan	Pahang	Malacca	Kedah	Johore
				JANUARY				
Smoked sheet	29.38-31.08	27.84-29.63	27.47-30.08	26.80-30.40	27.42-30.93	30.16-31.50	29.06-30.35	28.33-29.97
Unsmoked sheet	28.38-30.25	26.14-28.73	24.66-27.33	25.30-29.10	25.50-28.62	28.66-29.75	28.07-29.20	27.02-28.88
Scrap	22.22-23.48	—	24.50-26.00	23.13-26.42	—	26.16-26.50	23.00-24.50	24.83-25.93
				FEBRUARY				
Smoked sheet	32.00-33.68	30.20-32.55	29.42-31.56	30.20-32.72	29.85-32.51	32.33-33.33	31.62-32.90	30.69-32.53
Unsmoked sheet	30.50-32.95	28.87-30.96	27.83-29.76	28.40-31.60	27.88-30.92	30.66-31.66	31.25-32.15	29.26-31.12
Scrap	25.66-27.16	26.00	26.00-27.75	25.66-27.83	—	27.33-28.33	26.83-27.70	27.31-28.64
				MARCH				
Smoked sheet	32.75-34.25	31.71-32.99	31.25-32.88	31.30-33.26	30.67-32.53	32.83-33.70	32.97-33.42	31.51-32.85
Unsmoked sheet	31.38-33.50	30.40-31.58	28.00-29.80	30.10-31.90	29.88-31.45	31.08-32.50	31.62-32.32	30.72-32.12
Scrap	26.38-27.94	28.00	27.00-28.50	26.00-27.50	—	28.33-29.66	27.16-28.66	28.33-29.29

Table III.

Production of Rubber on Small Holdings.

(in tons)

	Total Year 1935	1st Quarter 1935	1st Quarter 1936
Federated Malay States ...	67,380	16,736	14,796
Unfederated Malay States ...	54,861	16,021	11,561
Straits Settlements ...	13,258	2,867	2,997
Total ...	135,499	35,624	29,354

35 per cent. or 137,400 acres at the beginning of January. The lack of proportionate increase in the acreage quoted is due to the fact that a revised figure for the total acreage of rubber small holdings in Johore has been received from the Johore Restriction Office, and is considerably lower than the previously accepted figure.

The area out of tapping in Kedah was estimated to be 50,900 acres (50.5 per cent.) as compared with 38,300 acres (38 per cent.) at the beginning of the year.

Ignoring Perlis, Kelantan and Trengganu, in which States the area of rubber small holdings is relatively small, the total area of rubber on small holdings out of tapping at the end of the first quarter 1936 was estimated to be 448,200 acres, or 41.8 per cent.

The extremely high price obtainable for coupons was again the principal reason adduced for the continued increase in the areas untapped. Coupons were sold at $25 per picul equivalent, and, in many cases, the quarter's issue was disposed of in the first month. Where coupons have not been sold, they are usually exhausted before the end of the quarter, resulting in the relative holdings being untapped.

Padi harvesting was, as usual, responsible for a reduction in tapping, and an even more important factor was the incidence of "wintering", which in some districts was severe, resulting in lessened flow of latex.

Table IV.

Estimated Acreage of Tappable Rubber which was out of Tapping on Holdings of less than 100 Acres, at the end of March, 1936.

PERAK				SELANGOR				NEGRI SEMBILAN				PAHANG			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Batang Padang	37,288	13,000	35	Klang	18,879	7,200	38	Seremban	19,241	17,900	93	Raub	7,361	4,800	65
Kinta	34,180	6,500	19	Kuala Langat	29,263	9,400	32	Tampin	17,947	13,100	73	Kuala Lipis	15,951	2,700	17
Kuala Kangsar	43,485	23,500	54	Ulu Langat	38,867	13,600	35	Kuala Pilah	17,470	8,900	51	Bentong	13,600	3,100	23
Upper Perak	13,774	7,200	52	Ulu Selangor	30,632	10,100	33	Jelebu	6,270	2,400	39	Other Districts†	31,223	9,100	29
Larut & Selama	51,407	7,700	15	Kuala Lumpur†	21,174	7,200	34	Port Dickson	10,653	8,000	75				
Krian	9,751	8,500	87	Kuala Selangor†	9,379	3,200	34								
Lower Perak*	47,937	25,900	54												
Dindings	7,279	6,300	86												
	245,101	98,600	40		148,194	50,700	34		71,581	50,300	70		68,135	19,700	29

MALACCA				PENANG & P. WELLESLEY				SINGAPORE			
District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage	District	Total Tappable area	Total area untapped	Percentage
Central	17,687	9,000	51	North	3,241	800	24	Singapore	12,781	1,000	8
Alor Gajah	31,387	14,400	46	Central	7,067	2,000	29				
Jasin	24,971	4,500	18	South	8,149	6,100	75				
				Penang	11,114	1,600	14				
	74,045	27,900	35		29,571	10,500	36		12,781	1,000	8

Johore	322,225	138,600	43
Kedah	100,691	50,900	50.5

The percentage of areas out of tapping in December, 1935, was as follows:—Perak 29, Selangor 29, Negri Sembilan 64, Pahang 65, Malacca 30, Penang and Province Wellesley 31, Singapore 9.

* Estimated from percentage for Kuala Kangsar.

†Estimated from percentage for other Districts in the State.

Condition of Holdings.

Reports indicate that a satisfactory standard of upkeep is being maintained, due in large measure to the work of Asiatic Rubber Instructors to which reference is made elsewhere in this summary.

One welcome result of the reduction in tapping is the extended resting period the trees are obtaining with consequent substantial improvement in bark renewal.

Diseases.

Both wet and dry root rot have been observed in all Districts of Perak Central, the most serious cases being in Sitiawan and the Dindings on the large holdings, where control measures are being carefully carried out. In other Districts the Malays are inclined to neglect control measures in spite of advice given.

The report from Pahang indicates that a fair amount of root disease is also to be found in most small holdings in that State. The report adds that little attention is given to control in the majority of cases, but that in a few areas, following the advice of the Asiatic Rubber Instructors, isolation drains have been dug.

Several cases of root diseases were treated in the Bandar Bharu District of Kedah.

Minor outbreaks of Pink Disease were reported from Lipis and Temerloh Districts, and all cases were under treatment. This disease was also reported in the Kluang District of Johore.

Mouldy Rot was in general evidence, but, in most parts of the Peninsula, the dry weather of February and early March was unfavourable to its spread.

On the other hand the dry weather, following "wintering", has been responsible for the widespread re-appearance of secondary leaf fall, *Oidium Heveae*, but nearly all reports state that the attacks are not serious.

Grades of Rubber.

Reports indicate that the general tendency is towards a preference for unsmoked sheet, but this is undoubtedly due to the high price which is being paid for this grade, making it almost uneconomic to smoke sheet.

It has been decided, however, to restrict the All-Malayan Rubber Small-Holders' Competition to smoked sheet only, and small-holders have been advised of this fact.

Kedah.—There was an increase in the production of smoked sheet, but in Central Kedah the percentage of scrap sold was exceptionally high. The percentages of smoked and unsmoked sheet respectively were:—North Kedah 90, 9; Central Kedah 50, 14, (scrap 36); South Kedah 51, 45.

Perak.—There is marked preference for unsmoked sheet in nearly all parts of Perak. At Selama, smoked sheet continues to be the form in which the majority of the rubber is sold. At Bagan Serai the percentages were:—smoked

31, unsmoked 69. At Taiping the majority of rubber sold was smoked. In Perak Central the percentages were:—smoked 49, unsmoked 51, and in Perak South 34.6 and 65.3 respectively.

Selangor.—The production of unsmoked sheet is reported to be decreasing, most of the rubber sold being in the form of smoked sheet.

Penang and Province Wellesley.—Percentages of sales of smoked and unsmoked sheet were only slightly changed as compared with the previous quarter; they were: smoked 9.5 and unsmoked 85.5.

Malacca.—There was a slight variation in the percentages of grades sold which were as follows:—Central, smoked 76, unsmoked 20; Alor Gajah, smoked nil, unsmoked 98; Jasin, smoked 59, unsmoked 40.75.

Negri Sembilan.—There was a considerable increase in the production of smoked sheet, the average percentages of the sales of 27 dealers being: smoked 53, unsmoked 47.

General.

The Asiatic Rubber Instructors continue to do good work, and much interest is shewn in the cheap form of smoke house which they are exhibiting, although, as mentioned elsewhere in this report, the fact that the present difference in price between smoked and unsmoked sheet is small minimizes the chances of extending the use of these smoke cabinets. Even so, a large number have been erected during the quarter under review, and a number more are under construction.

In Perak, sulphuric acid coagulants are still widely used by small-holders, as they are much cheaper and are sold in convenient quantities. In Selama, Perak, however, formic acid, usually at a reasonable price, is in general use, but it appears that unless this acid can be supplied at competitive rates there is little prospect of converting the average small-holder to its use.

In Pahang a scheme has been inaugurated in all Districts whereby rubber dealers are required to display samples of the various grades of rubber, shewing the difference in price between such grades. The object is to obtain a higher price for the better grade produced, and also to shew small-holders the value of grading, and the losses they incur if they produce a low-grade product. The scheme has been adopted by the dealers without much complaint, and at the end of the quarter all dealers were carrying out instructions.

Reviews.

An Outline of Malayan Agriculture.

Compiled by D. H. Grist. 388 pp. 86 plates and 2 maps. Malayan Planting Manual No. 2. Department of Agriculture, S.S. and F.M.S. 1936. Price $3 Straits currency or 7 shillings post free.

Agriculture in Malaya has developed rapidly in recent years, its growth being accelerated by the collapse of the rubber and tin markets which focussed attention on the need for investigation into the potentialities of other natural sources of wealth.

With this change in agricultural conditions the need became obvious for an authoritative publication which would present a clear-cut picture of Malayan agricultural development, together with such an outline of the history, geography and geological structure of the Peninsula as is necessary for a clear understanding of the main subject, and with an account of the crops which can be grown in the country, methods of cultivation, and economic possibilities.

The Department of Agriculture, Straits Settlements and Federated Malay States, accordingly undertook the production of *An Outline of Malayan Agriculture* to provide a comprehensive summary of the chief historical features and of the present agricultural life of the country.

The book is divided into six parts with a total of 33 chapters, together with appendices and an index.

The introductory chapter in Part I deals briefly with the geographical position of Malaya, its climate, geology and soils; followed by paragraphs on its political geography, communications, population, and agricultural industries. Other chapters in this Part concern the system of land tenure, agricultural policy, agricultural co-operation and the organization of agricultural services.

Part II comprises two chapters dealing respectively with methods of cultivation and soil treatment. These subjects are treated in a general way, as more precise information is given on the same subjects in the subseqent discussion of various crops.

The following three Parts contain information on the history, methods of cultivation, soils suitable, areas under cultivation, preparation for market, trade and market prices of tropical crops found in Malaya and of such sub-tropical or temperate-climate crops as have attracted attention in the highland region of the country. The last Part is concerned with cattle, pigs, poultry and fresh-water fish. The chapters summarize the present position in connexion with stock-raising and the advances made to-date in effecting improvements, as regards the quality of stock, feeding and housing.

The appendices give a list of import and export duties on agricultural products, a comprehensive bibliography of Malayan agriculture, and tables of local weights and measures.

The illustrations are clear, and definitely assist the text, while the inclusion of a general map of Malaya and of a geological map further assists the reader.

While *An Outline of Malayan Agriculture* is designed primarily for those interested in agriculture in the Malay Peninsula, it is thought that its appeal will not be confined to these shores. Agriculturists in other tropical countries may find within its pages information that may result in developments in their own regions, while agricultural training centres may consider the range of crops described as typical of a large number of tropical countries throughout the world.

The Chemistry of Milk.

W. L. Davies. 522 pp. Chapman and Hall Ltd., London, 1936. Price 25 shillings.

A new work on the chemistry of milk is justified if it is sufficiently comprehensive in its scope, and gives adequate consideration to the long established knowledge of the subject, new aspects of old work and to the more recent work on the subject. Within the five parts of this book dealing with the composition, constituents and physical chemistry of milk, the chemistry of milk processing and the nutritive value of milk, the author covers the subject very thoroughly, while the 1,400 references included in the text are evidence of the close consideration which has been given to the relevant and important investigations which are scattered in scientific literature and specialized text-books.

The author writes for both pure and applied chemists, physiologists, nutritionists and for members of the medical profession. He adds that the contents will also be of value to research workers in biochemistry, agricultural chemistry and the chemistry of foods, since the present position of many subjects is explained and indications given of future problems requiring solution.

The book is commended because the author has achieved his object with conspicuous success.

Departmental.

FROM THE DISTRICTS.

Compiled by the Chief Field Officer from Monthly Reports submitted by Agricultural Officers.

April 1936.

The Weather.

The weather during April was showery, as is usual for this month; precipitation was somewhat below normal in many areas, but in others it was equal to or in excess of the average. The latter included the areas around Taiping, Kuala Kangsar and Telok Anson, the Kuala Lumpur District and country round Kuala Selangor, Jelebu District, Raub, Temerloh and Kuantan Districts, the coast of Kelantan and the inland parts of Johore. Along the west coast, however, from Krian southward, rainfall was deficient practically throughout, while in Bagan Datoh and Sabak Bernam Districts and on the coast of Muar District very dry conditions, with only about 2 inches of rain, were experienced.

Remarks on Crops.

Padi.—Harvest was practically completed everywhere at the end of the month. In Kedah, crop returns show a total of 96,000,000 gantangs, which is probably the highest crop on record and is due in part, at least, to an increase in the planted area. The crop in Penang and Province Wellesley is known to be considerably below that of 1935, while that in the Bruas District of Perak was poor. Elsewhere, however, average crops were expected. Some good yields were recorded from the Panchang Bedena area in Selangor.

Work on this season's crop was in progress in the inland parts of Selangor, the riverine mukims of Pahang and in northern and central Johore.

At the request of the people of Semantan mukim in Temerloh District of Pahang, two expert ploughmen from Malacca worked in the mukim for 21 days during the month, their expenses being provided collectively by the local padi growers. The latter thus were able to acquire considerable knowledge of ploughing and of the manufacture of the wooden parts of ploughs and harrows.

Surplus padi from the Panchang Bedena area was being purchased in considerable quantities by Chinese dealers for export to Port Swettenham and other small ports along the Selangor coast for feeding poultry. The price given was $6.50 per 100 gantangs.

Local demand for pure strain padi seed in Malacca was, as usual, greatly in excess of the supply, so that rationing by Districts was necessary. It was reported that secondary distribution was taking place to a considerable extent through the medium of cultivators who are already growers of these strains. Siam 29 and Nachin 11 were the strains most in demand.

Rubber.—Wintering in northern and central Pahang was late and irregular, and had not terminated by the end of the month. This was in strong contrast to the early and rapid leaf fall which occurred in most other parts of the Peninsula.

The new issue of export coupons to small-holders was made at the beginning of the month. Somewhat contrary to expectations this issue did not cause a great increase in the number of holdings tapped, except in areas such as Penang and Province Wellesley, parts of Selangor, Malacca, central Pahang and south Johore, where peasant proprietors and paid tappers have no other work to which they can turn their attention. Tappers cannot usually obtain a full quarter's work at an adequate wage because, when coupons are exhausted, the sale of uncouponed rubber does not permit of sufficient payment to support them. Owners of land can make about as much by selling their coupons without tapping as they can by selling couponed rubber after deducting tapping costs. Consequently, where other occupations are available, such as padi work, fishing, or employment as labourers on estates or public works, both owners of land and tappers prefer these other sources of income to tapping rubber.

One effect of the new issue of coupons was to lower their price from a maximum of $28 to a range of $24 to $27 per picul of export rights. The price of rubber without coupons rose correspondingly to as much as $9 per picul for smoked sheet and $6 to $8 for unsmoked sheet.

Leaf mildew (*Oidium Heveae*) was reported from several localities in Kedah and was found for the first time on three estates and adjoining small holdings in the Temerloh District of Pahang. The disease continued to be present in all the areas from which it was reported in March, but towards the end of the month it began to clear up. Except in a few instances in which sulphur dusting had to be undertaken, the outbreak was mild.

The Asiatic Rubber Instructors have effected a definite improvement in the quality of the sheet made in some of the areas where they have been working and have secured the erection of several additional smoke cabinets. The margin between the price of smoked and that of unsmoked sheet continued, however, to be quite small and so to offer little inducement to prepare smoked sheet.

Copra.—The "twin" kiln, with twice the capacity of the "30-acre" kiln described in the April number of this Journal, was further tested in Bagan Datoh District during the month. The tests showed conclusively that copra of estate quality could be made on this kiln in 30 hours. The size of the kiln is better adapted to the requirements of small-holders, the "30-acre" kiln being too small for reasons given in this summary for March. Two "twin" kilns were built in Johore North and were reported to be working satisfactorily at the end of the month. In Johore as in Bagan Datoh District, the "30-acre" kiln is considered too small, but the "twin" kiln has attracted considerable attention.

In Province Wellesley the crop of nuts increased and, in consequence, competition for supplies became so much relaxed that Malay kiln-owners were again able to commence making copra.

Pineapples.—Supplies of fruit gradually increased during the month, so that factories were able to work steadily, though not at full capacity. Eight were working in Johore, four in Singapore and one in Selangor. In Selangor prices for fruit were $1.20 to $1.50, but in Johore from $1.80 to $3 and in Singapore $2.10 per hundred.

Fruits.—In certain parts of the country small areas of water melons have produced crops. These sold at prices varying from 12 to 20 cents each. In Jelebu District of Negri Sembilan durians and langsats were fruiting and small quantities were being sold on the Seremban market.

Agricultural Stations and Padi Test Plots.

At the Kuala Kangsar Station the first fruits from imported Marsh's Seedless Grapefruit trees were harvested. These were examined and thought to be rather poor in quality, but this may improve somewhat when the trees have been fruiting for a longer period. Two Lisbon Lemon trees at Bukit Mertajam Station were also bearing their first fruits which, of their kind, were of better quality than the grape fruits. Both the lemon and the grapefruit trees are budded plants which were imported from South Africa in 1932.

In Kelantan 10 acres of land at Bachok were being cleared for development as an Agricultural Station to include wet and dry padi, permanent and rotation crops.

In Johore the work of clearing the Agricultural Station site at Tangkah was continued and plots and paths were demarcated. Clearing work was continued on the site of the Central Experiment Station at Ayer Hitam and felling was commenced on the land reserved for a Pineapple Experiment Station and Agricultural Station in south Johore.

Harvest was completed or nearly completed on the Panchang Bedena and Sungei Haji Durani Padi Test Plots in Selangor, the Lipis and Sungei Blat Test Plots in Pahang, the Tangkah Plot in Johore North and the Kilanas and Lumapas Plots in Brunei. Yields on the Lipis Plot were disappointing owing to unfavourable weather conditions during growth, being on the average little over 100 gantangs per acre. The best yielding strains were Siam 29 with 350 gantangs, Reyong 20 with 344 gantangs and Nachin 66 with 310 gantangs per acre. On the Tangkah Plot all selected strains did well, with the exception of Radin 7, while the Nachin and Siam strains yielded over 400 gantangs per acre. The four local varieties grown proved mediocre in yield, the best being Serendah Kuning. On the Kilanas Plot Seraups 15 and 36, Siam 29 and 76 and Nachin 66 gave fairly good crops and the native variety Jongkok yielded well. On the Lumapas Plot there were no Latin Square variety trials, but preliminary single plant selections were made from the local varieties Jongkok, Pulut Merikan and Radin Pasir. In the multiplication plots of these varieties Jongkok gave 375 gantangs and both Radin Pasir and Pulut Merikan 295 gantangs per acre.

Land was prepared for planting and nurseries were sown on the Kajang Test Plot in Selangor, the Kendong and Kuala Klawang Test Plots in Negri Sembilan and the Jementah and Tenglu Test Plots in Johore.

All-Malayan Padi Competition.

Mukim padi competitions were held in ten centres of the Tampin-Rembau District in Negri Sembilan. The total number of exhibits was only 139, a further drop compared with the figures for the two preceding seasons. In this District the falling off in the number of exhibits appears to be due to the fact that a three gantang exhibit is considered too heavy to bring from any distance, unless easy means of transport are available. Reasonably large exhibits are, however, necessary to the purposes of the competition.

In Pahang East a series of competitions was held in the riverine mukims of Pekan District. The number of entries at each centre was very encouraging and the attendance, which consisted mostly of the exhibitors themselves, was good.

District Agricultural Show, Segamat.

A District Agricultural Show was held at Segamat in Johore on April 16th and 17th and was opened by His Highness the Tengku Makhota. The attendance during the two days was estimated at 16,000 and included a number of distinguished visitors. In this respect the Show was a success. The quality and number of exhibits were, however, disappointing, except in the padi and livestock sections, mainly because the Show was held too early in the year, many exhibits for which classes were provided, especially in the fruit section, being out of season. The winning padi as in 1935 was Nachin Puteh.

The Department of Agriculture staged an exhibit dealing with the subjects of padi, budded fruit trees, tobacco, arecanuts, coffee, tapioca and gambier together with models of poultry houses. A small-holder's rubber smoke cabinet was erected and on both days the Asiatic Rubber Instructor gave demonstrations on the preparation of first quality smoked sheet.

Holiday Course for Schoolboys.

During the period April 14th to 18th inclusive, a holiday course on certain agricultural subjects was given at the Bukit Mertajam Agricultural Station in Province Wellesley to a large and enthusiastic class of pupils from the Bukit Mertajam High School.

DEPARTMENTAL NOTES.

Visits of the Adviser on Agriculture.

The Hon'ble the Director of Agriculture, S.S. and Adviser on Agriculture, Malay States, visited Singapore and Johore on 17th and 18th April, 1936. In the morning of the first day he discussed questions concerning the pineapple canning industry with the Health authorities and the Registrar-General of Statistics. In the afternoon, accompanied by Mr. W. J. Johnson, Canning Officer, he attended a conference in Singapore of pineapple packers.

On 18th April, accompanied by the Canning Officer, the Agricultural Adviser conferred with the State Agricultural Officer, Johore, and with the Sanitary authorities in Johore regarding the pineapple packing industry. In the afternoon, he visited pineapple factories in Johore and the site for the new Pineapple Experimental Station at Kota Tinggi, Johore.

Agricultural Advisory Committee.

A meeting of the Agricultural Advisory Committee was held at the Department of Agriculture, Kuala Lumpur, on 13th April, 1936.

Appointment.

Mr. J. R. P. Soper, B.A., Agricultural Officer, Zanzibar, has been appointed Agricultural Officer, Department of Agriculture, S.S. and F.M.S. from 2nd April 1936. Mr. Soper arrived in Malaya and took over the duties of Agricultural Field Officer, Province Wellesley and Penang, on 23rd April, 1936.

Rural Lecture Caravan.

The Rural Lecture Caravan toured Penang and Province Wellesley during the month. Large audiences were attracted at all centres.

Refresher Course at School of Agriculture.

A Refresher Course for Malay Agricultural Assistants in this Department was given at the School of Agriculture, Malaya, from 20th to 23rd April inclusive.

Leave.

Mr. R. A. Altson, Assistant Mycologist, has been granted 8 months and 2 days leave from 9th May 1936 to 10th January, 1937.

Statistical.

MARKET PRICES.

April, 1936.

Major Crops.

Rubber.—The market improved still further during April, but weakened suddenly at the close upon the announcement of the increase in the quota. Spot loose opened at 26⅛ cents per lb. and rose steadily to 26⅞ cents on the 16th and 17th April; thereafter the price fell slightly, and later dropped to 26⅛ cents on the 29th, closing at 26 5/16 cents. The average price for April of No. I X. Rubber Smoked Sheet was 26.49 cents per lb. as compared with 26.04 cents in the previous month. The London average price was 7.53 pence per lb., and the New York price 15.92 cents gold, as compared with 7.44 pence and 15.86 cents gold in March.

Prices paid for small-holders' rubber at three centres during the month are shewn in the following table.

Table I.

Weekly Prices Paid By Local Dealers for Small-Holders' Rubber, April, 1936.

(Dollars per Picul.)

Grades.	Kuala Pilah, Negri Sembilan.					Kuala Kangsar, Perak.				Batu Pahat, Johore.				
	2	9	16	23	30	1	15	22	29	1	8	15	22	29
Smoked sheet			34.00	33.50	33.64	32.80	33.57	34.00	34.00		33.25	33.60		32.49
Unsmoked sheet	32.55	32.12	32.00	32.90	32.00		32.42	33.00	32.00	31.70	32.40		32.00	32.00
Scrap		26.80	28.00	29.00							30.00			

Transport by F. M. S. R. lorry service Kuala Pilah to Seremban 12 cents per picul, to Malacca excluding duty, 25 cents per picul, by rail Seremban to Penang $1.24 per picul, Seremban to Singapore $8.00 per ton.

Transport from Batu Pahat to Singapore by lorry excluding duty, 90 cents per picul.

Transport from Kuala Kangsar to Prai by railway $6.20 per ton.

Transport from Kuala Kangsar to Singapore by railway $10.00 per ton (minimum consignment 5 tons).

At Kuala Pilah the standard deduction for moisture in unsmoked sheet is 5 per cent.

At Kuala Kangsar the standard deduction for moisture in unsmoked sheet is 10 per cent

No purchases at Kuala Kangsar on the 8th April.

Palm Oil.—Prices weakened still further during April, and are given in the following table.

Table II.

Prices of Palm Oil and Palm Kernels.

Date 1936.	Palm Oil in Bulk, c i.f. landed weight Liverpool/ Halifax.	Palm Kernels, c.i.f. landed weight London/ Continent
	per ton	per ton
April 3	18. 5 0	10 0. 0
„ 10	18. 0. 0	10. 0. 0
„ 17	17 0. 0	9. 15. 0
„ 24	17. 0 0	9. 10. 0

Copra.—The market continued to fall during April, after an improvement during the first week; thereafter the price fell steadily. The sun-dried grade opened in Singapore at $5.25 per picul, and closed at $4.50, the monthly average being $5.03 per picul as compared with $5.09 in March. The mixed quality did not fall proportionately, the difference between the two grades being only 30 cents at the close and the average price remained unchanged at $4.59 per picul.

Copra cake improved still further and averaged $1.55 per picul as compared with $1.32 in March.

Rice.—The average wholesale prices of rice per picul in Singapore for March were as follows:—Siam No. 2 (ordinary) $3.85, Rangoon No. 1 $3.30, Saigon $3.60, as compared with the February corresponding prices of $3.81, $3.35 and $3.35. March 1935 prices were $3.77, $3.45 and $3.55.

The average retail market prices in cents per gantang of No. 2 Siam rice in March were:—Singapore 30, Penang 28, Malacca 26, as compared with 32, 28 and 26 respectively in February.

The average declared trade value of imports of rice in March was $3.56 per picul, as compared with $3.46 in February, and $3.64 in January.

Padi.—The Government Rice Mill at Krian were offering $2.10 per picul for padi but purchases were negligible. The Government Rice Mill at Temerloh, Pahang, reduced its price from $2 to $1.90 per picul on the 10th April. Retail prices of padi ranged from 5 cents to 14 cents per gantang, these extremes being quoted in Johore only.

Pineapples.—Packers reduced prices during April, and the market was quiet with not much business passing. Average prices per case for the month were:—Cubes $3.16, Sliced Flat $3.07, Sliced Tall $3.16, as compared with $3.27, $3.16 and $3.25 respectively in March.

Prices of fresh fruit per 100 were: Selangor $1.20 to $1.50; Johore $1.80 to $3; Singapore $2.10.

Beverages.

Tea.—Six consignments of Malayan tea were sold on the London Market in April. Two consignments were of upland tea and averaged 1s. 0½d. and 1s. 1d. per lb. and the remaining consignments, of lowland tea, were sold at prices of 1s. 0d. and 1s. 0¼d. per lb.

Average London prices per lb. during April for tea consignments from other countries were as follows:—Ceylon 1s. 3.93d., Java 10.93d., Indian Northern 1s. 0.77d., Indian Southern 1s. 2.02d., Sumatra 10.47d.

The latest Colombo average prices available are quoted from the *Weekly Tea Market Report,* 21st April, 1936, of the Colombo Brokers' Association, and are as follows (rupee cents per lb.):—High Grown Teas 66 cents, Medium Grown Teas 59 cents, Low Grown Teas 57 cents.

Coffee.—Prices of coffee in Singapore were lower during April. Sourabaya coffee fell from $12 to $14 per picul to $12 to $13, and Palembang coffee averaged $7.10 to $8.10 per picul, as compared with $7.31 to $8.37 in March.

Prices of locally-grown coffee remained on a low level, ranging from $12 to $28 per picul for both robusta and Liberian. The latter quality was quoted at $8 per picul in Singapore.

Spices.

Arecanuts.—Singapore prices improved during April, and average prices per picul were:—Splits $4.45 to $6.10; Red Whole $5.35 to $6.40; Sliced $8.30 to $9.30.

The Singapore Chamber of Commerce average prices per picul were:—Best $6.12, Medium $5.58, Mixed $4.24, as compared with $6.17, $5.60 and $4.35 respectively in March.

Pepper.—The market in Singapore is stagnant and prices are nominal; they remained the same as in the previous month and were:—Singapore Black $8.50, Singapore White $16, Muntok White $16.50 per picul.

Nutmegs.—Prices improved slightly at the beginning of the month and weakened again in the second half. Average prices per picul were: 110's $29.25, 80's $30.25, as compared with $28.25 and $29 respectively in March.

Mace.—Siouw opened at a higher level but weakened early in the month, averaging $91.25 per picul as against $92.50 in March. Amboina was quoted throughout at $75 per picul as compared with an average price of $73.75 in the previous month.

Cloves.—Nominal quotations of both Zanzibar and Amboina continued unchanged at $38 per picul.

Cardamoms.—Green cardamoms were quoted in the Ceylon Chamber of Commerce reports at Rs. 1.20 to Rs. 1.35 at the beginning of April, rising to Rs. 1.35 to Rs. 1.43 at the close.

Miscellaneous.

Tuba Root (Derris).—The Singapore market was quiet during April. Prices were irregular but the averages for the month were unchanged in comparison with March; they were: roots sold on rotenone content $52 per picul, and on a basis of ether extract $34.50.

Gambier.—A slight fall in the price of Block in the second half of April reduced the month's average to $6.25 per picul as compared with $6.50 in March. No. 1 Block remained unchanged at $10.50 per picul.

Tapioca.—Prices again continued unchanged, and were:—Flake, Fair $5.50, Seed Pearl $5.50, Medium Pearl $6.50 per picul.

Sago.—Pearl, Small Fair, was quoted throughout the month at $3.80 per picul as compared with an average price of $3.75 in March. Flour, Sarawak Fair, fell 2½ cents at the beginning of the month but recovered at the close. The average price was $2.30 per picul as compared with $2.35 in March.

Tobacco.—Prices in Kelantan were $75, $60 and $50 per picul for first, second and third qualities respectively. Elsewhere, prices were lower, ranging from $25 to $35 for first quality, $21 to $28 for second quality, and from $10 to $20 for third quality.

The above prices are based on London and Singapore daily quotations for rubber; on the Singapore Chamber of Commerce Weekly Reports for the month and on other local sources of information. Palm oil reports are kindly supplied by Messrs. Guthrie & Co. Ltd., Kuala Lumpur; the Singapore prices for coffee and arecanuts by the Lianqui Trading Company of Singapore, and tuba prices by Messrs. Mackay & Co., Singapore.

1 picul = 133⅓ lbs. The Dollar is fixed at two shillings and four pence.

Note.—The Department of Agriculture will be pleased to assist planters in finding a market for agricultural produce. Similar assistance is also offered by the Malayan Information Agency, 57, Charing Cross. London, S.W.1.

GENERAL RICE SUMMARY*

March, 1936.

Malaya.—March imports of foreign rice were 53,435 tons, and exports 13,785 tons. Net imports for January to March totalled 123,586 tons, an increase of 9.3 per cent. as compared with 1935.†

Of the March imports 57 per cent. were consigned to Singapore, 15 per cent. to Penang, 5 per cent. to Malacca, 21 per cent. to the Federated Malay States, and 2 per cent. to the Unfederated Malay States. Of the total, 66 per cent. were from Siam, 27 per cent. from Burma, 5 per cent. from French Indo-China, and 2 per cent. from other countries.

Of the exports during March, 76 per cent. were consigned to the Netherlands Indies, and 24 per cent. to other countries. The various kinds of rice exported were (in tons, percentages in brackets):—Siam 9,861 (71.5), Burma 2,873 (20.8), French Indo-China 456 (3.3), parboiled 517 (3.8), local production 78 (0.6).

India and Burma.—Foreign exports during January and February totalled 177,000 tons, as compared with 296,000 in 1935, a decrease of 40.2 per cent. Of these exports, 5.1 per cent. were to the United Kingdom, 10.7 to the Continent of Europe, 44.1 per cent. to Ceylon, 23.7 per cent. to the Straits Settlements and the Far East, and 16.4 per cent. to other countries. The corresponding percentages during 1935 were 3.4, 5.8, 26.0 39.5 and 25.3.

Burma's total exports of rice and bran (*Bangkok Times*, 30th March, 1936) during January and February aggregated 608,113 metric tons, as compared with 705,750 metric tons in 1935, a decrease of 13.8 per cent.

Siam.—Exports of rice and rice products from Bangkok during February are provisionally given as 109,912 tons. The cumulative total is 249,361 tons as compared with 304,192 tons in 1935.

Japan.—According to the *Trans-Pacific Journal*, 12th March, 1936, Japan's actual rice crop for 1935 amounted to 8,058,482 tons, an increase of 10.8 per cent. when compared with 1934.

Stocks of rice in Japan on 1st March, 1936, were 6,121,560 tons. The supply during the remaining eight months of the rice year is estimated at 7,312,763 tons, with demand 6,072,931 tons, which will leave 1,239,832 tons to be carried over into the next rice year.

French Indo-China.—Entries of padi into Cholon during the first quarter of the year totalled 521,792 metric tons, as compared with 586,517 metric tons in 1935, a decrease of 11 per cent. Exports of rice for the same period decreased by 21.9 per cent. to 453,267 metric tons as against 580,351 metric tons in 1935.

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*Abridged from the Rice Summary for February, 1936, compiled by the Department of Statistics, Straits Settlements and Federated Malay States.

†It is to be understood throughout the summary that all comparisons and percentage increases or decreases are in relation to the corresponding period of 1935.

Netherlands Indies.—The latest information available was published in the Summary for February 1936.

Ceylon.—Imports during the first quarter totalled 142,322 tons, as compared with 133,715 tons in 1935, an increase of 6.4 per cent.

Of these imports 10.9 per cent. were from British India, 66.7 per cent. from Burma, 0.2 per cent. from the Straits Settlements, and 22.2 per cent. from other countries. The 1935 corresponding percentages were 10.4, 73.1, 1.3 and 15.2.

Europe and America.—Shipments to Europe from the East during the period 1st January to 13th March aggregated 142,714 tons, as compared with 116,448 tons in 1935, an increase of 22.6 per cent. Of these, 49.5 per cent. were from Burma, 39.5 per cent. from Saigon, 8.4 per cent. from Siam, and 2.6 per cent. from Bengal. The corresponding percentages for 1935 were 63.1, 23.0, 11.2 and 2.7.

Shipments for the Levant from the 1st January to 25th February were 2,771 tons, a decrease of 79.4 per cent. and to Cuba, West Indies and America from 1st January to 11th March totalled 30,734 tons, a decrease of 11.6 per cent.

MALAYAN AGRICULTURAL EXPORTS, MARCH, 1936.

PRODUCT.	Net Exports in Tons				
	Year 1935	Jan.-March 1935	Jan.-March 1936	March 1935	March 1936
Arecanuts ...	21,588	6,813	7,893	3,189	2,074
Coconuts fresh † ...	106,272†	22.825†	26,364†	8,080†	8,852†
Coconut oil ...	35,911	7,271	10,398	2,706	3,779
Copra ...	111,752	30,366	17,040	7,276	8,107
Gambier, all kinds ...	2,837	672	516	250	101
Oil cakes ...	11,361	2,235	2,955	265	1,398
Palm kernels ...	3,892	825	983	460	401
Palm oil ...	24,996	4,423	4,400	1,247	1,062
Pineapples canned ...	73,923	14,874	15,707	5,250	4,175
Rubber ¶ ...	378,381¶	96,788¶	83,999¶	29,658¶	23,400¶
Sago,—flour ...	10,920	3,726	458*	1,020	843
,, —pearl ...	4,655	1,110	707	321	248
,, —raw ...	7,735*	1,723*	2,073*	583*	738*
Tapioca,—flake ...	1,953	504	500	108	178
,, —flour ...	755*	335*	429*	220*	155*
,, —pearl ...	17,169	2,994	3,055	983	1,111
Tuba root ...	567	133½	188½	3*	71½

† hundreds in number. * net imports. ¶ production.

MALAYAN PRODUCTION (IN TONS) OF PALM OIL AND KERNELS

(As declared by Estates)

Month 1936	Palm Oil		Palm Kernels	
	F.M.S.	U.M.S.	F.M.S.	U.M.S.
January ...	1,395.4	326.5	258.6	37.2
February ...	1,531.9	372.4	244.2	54.6
March ...	1,878.4	534.5	302.9	88.0
Total ...	4,805.7	1,233.4	805.7	179.8
Total January to March 1935 ...	3,144.0	894.4	508.3	136.7
Total for year 1935 ...	17,338.7	5,764.6	2,711.1	818.4

MALAYAN RUBBER STATISTICS

ACREAGES OF TAPPABLE RUBBER NOT TAPPED ON ESTATES OF 100 ACRES AND OVER, FOR THE MONTH ENDING 31ST MARCH, 1936.

STATE OR TERRITORY	Acreage of Tappable Rubber end 1934	ESTATES WHICH HAVE ENTIRELY CEASED TAPPING		ESTATES WHICH HAVE PARTLY CEASED TAPPING (*a*)		AREA OF TAPPABLE RUBBER NEVER BEEN TAPPED		Total (3) + (5)	Percentage of (9) to (2)
		Acreage	Percentage of (3) to (2)	Acreage	Percentage of (5) to (2)	Acreage	Percentage of (7) to (2)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STRAITS SETTLEMENTS :—									
Province Wellesley	44,691	1,947	4.4	15,884	35.5	725	1.6	17,831	39.9
Malacca	123,793	3,087	2.5	34,582	27.9	3,412	2.8	37,669	30.4
Penang Island	2,593	130	5.0	489	18.9	254	9.8	619	23.9
Singapore Island	33,312	3,793	11.4	10,006	30.0	417	1.3	13,799	41.4
Total S.S. ...	204,389	8,957	4.4	60,961	29.8	4,808	2.4	69,918	34.2
FEDERATED MALAY STATES :—									
Perak	295,895	19,016	6.4	70,959	24.0	14,531	4.9	89,975	30.4
Selangor	345,100	13,333	3.9	76,599	22.2	17,066	4.9	89,932	26.1
Negri Sembilan	258,381	14,998	5.8	54,750	21.2	17,222	6.7	69,748	27.0
Pahang	75,912	11,518	15.2	27,066	35.6	18,561	24.5	38,584	50.8
Total F.M.S. ...	975,288	58,865	6.0	229,374	23.5	67,380	6.9	288,239	29.5
UNFEDERATED MALAY STATES :—									
Johore	417,633	21,544	5.2	68,734	16.4	43,698	10.5	90,278	21.6
Kedah	199,180	3,880	1.9	22,423	11.3	19,349	9.7	26,303	13.2
Kelantan	28,891	403	1.4	12,489	43.2	7,688	26.6	12,892	44.6
Trengganu (*b*)	4,643	Nil	Nil	15	0.3	179	3.9	15	0.3
Perlis (*c*)	1,206	Nil	Nil	653	54.1	59	4.9	653	54.1
Brunei	(*d*) 4,991	Nil	Nil	1,616	32.4	856	17.2	1,616	32.4
Total U.M.S. ...	656,544	25,827	3.9	105,930	16.2	71,829	10.9	131,757	20.1
TOTAL MALAYA ...	1,836,221	93,649	5.1	396,265	21.6	144,017	7.8	489,914	26.7

Notes :—(*a*) Area out of tapping on Estates which have partly ceased tapping refers to areas definitely being rested and excludes areas on any tapping round.
(*b*) Registered Companies only.
(*c*) Rendered quarterly.
(*d*) Acreage of tappable rubber on 1st May, 1934.

MALAYAN RUBBER STATISTICS — TABLE I

STOCKS, PRODUCTION, IMPORTS AND EXPORTS OF RUBBER, INCLUDING LATEX, CONCENTRATED LATEX AND REVERTEX, FOR THE MONTH OF MARCH, 1936, IN DRY TONS.

State or Territory	Stocks at beginning of month 1			Production by Estates of 100 acres and over		Production by Estates of less than 100 acres estimated 2		Imports				Exports including re-exports				Stocks at end of month			Consumption 3	
								during the month		January and Feb. 1936		during the month		January and Feb. 1936						
	Ports	Dealers	Estates of 100 acres and over	during the month	January and Feb. 1936	during the month	January and Feb. 1936	Foreign	From Malay States & Labuan	Foreign	From Malay States & Labuan	Foreign	Local	Foreign	Local	Ports	Dealers	Estates of 100 acres and over	during the month	January and Feb. 1936
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
MALAY STATES :—																				
Federated Malay States ...	...	7,262	12,088	8,572	28,830	3,789	14,796	Nil	Nil	Nil	Nil	11,472	2,376	32,791	11,483	...	5,224	12,631	8	21
Johore ...	...	2,091	4,125	3,560	11,761	1,511	8,023	Nil	40	Nil	98	2,403	3,209	6,428	13,593	...	1,599	4,116	...	...
Kedah ...	...	220	3,074	2,029	7,726	352	1,481	Nil	Nil	Nil	Nil	1,238	1,041	3,823	5,553	...	124	3,272	...	...
Perlis ...	...	12	17	8	33	5	57	Nil	Nil	Nil	Nil	Nil	18	Nil	90	...	4	20	...	...
Kelantan ...	...	309	309	242	828	373	1,490	Nil	Nil	Nil	Nil	137	442	416	1,799	...	271	383	...	...
Trengganu ...	...	55	50	317	696	159	349	Nil	Nil	Nil	Nil	Nil	476	Nil	1,045	...	55	50	...	...
Brunei ...	...	17	39	37	137	27	161	...	...	...	...	...	71	...	302	...	3	46	...	...
Total Malay States	...	9,966	19,702	14,765	50,011	6,216	26,357	Nil	40	Nil	98	15,250	7,633	43,458	33,865	...	7,280	20,518	8	21
S. SETTLEMENTS :—																				
Malacca ...	...	1,758	1,203	884	3,001	461	1,669	Nil		Nil		2,542		7,077		...	1,409	1,269	...	...
Province Wellesley	...	772	497	306	1,146	172	635	Nil		Nil		8,219		24,181		...	480	571	...	...
Penang ...	2,696	6,020	10	15	49	168	265	2,825	9,496	8,415	32,774		Nil		Nil	1,500	4,968	6	...	...
Singapore ...	4,739	24,966	186	127	438	266	379	9,161		34,817		20,541		49,373		3,565	19,289	162	21	64
Labuan ...	...	15	Nil	Nil	Nil	20	49	40		233		Nil		Nil		...	28	Nil	...	...
Total Straits Settlements ...	7,435	33,531	1,896	1,332	4,634	1,087	2,997	12,026	9,496	43,465	32,774	31,302	Nil	80,631	Nil	5,065	26,174	2,008	21	64
Total Malaya ...	7,435	43,497	21,598	16,097	54,645	7,303	29,354	12,026	9,536	43,465	32,872	43,552	7,633	124,089	33,865	5,065	33,454	22,526	29	85

TABLE II
DEALERS' STOCKS, IN DRY TONS 3

Class of Rubber	Federated Malay States	S'pore	Penang	Province We'sly D'dings M'cca.	Johore	Kedah
22	23	24	25	26	27	28
DRY RUBBER	4,517	18,545	4,574	1,716	1,476	63
WET RUBBER	707	744	394	204	123	61
TOTAL ...	5,224	19,289	4,968	1,920	1,599	124

TABLE III
FOREIGN EXPORTS

PORTS	For month	January and Feb. 1936
29	30	31
Singapore ...	30,989	76,893
Penang ...	10,976	33,023
Port Swettenham.	4,326	13,494
Malacca ...	261	679
MALAYA ...	46,552	124,089

TABLE IV
DOMESTIC EXPORTS 4

AREA	For month	January and Feb. 1936
32	33	34
Malay States ...	22,883	77,323
Straits Settlements	2,370	7,339
MALAYA ...	25,253	84,662

Notes :—

1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.
2. The production of estates of less than 100 acres is estimated from the formula : Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month. + Consumption, *i.e.*, Column [7] = Columns [13] + [14] + [17] + [18] + [19] + [20] − [2] − [3] − [4] − [5] − [9] − [10]. For the Straits Settlements the production of estates of less than 100 acres is represented by sales or exports as shown by cess paid.
3. Dealers' stocks in the Federated Malay States are reduced to dry weights by the following fixed ratios: unsmoked sheet, 15% wet sheet, 25% scrap, lump, etc., 40%; stocks elsewhere are in dry weights as reported by the dealers themselves.
4. Column (33) and (34) represent exports of rubber subject to regulation which, for Singapore and Penang Islands are represented by sales or exports as shown by cess paid.
5. All statements are brought up to date monthly, and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.
6. The above, with certain omissions, is the Report published by the Registrar-General of Statistics, S.S. and F.M.S., at Singapore on 23 April, 1936.

METEOROLOGICAL SUMMARY, MALAYA, MARCH, 1936.

Locality.	Air Temperature in degrees Fahrenheit							Earth Temperature		Rainfall								Bright Sunshine.		
	Means of			Absolute Extremes						Total.		Most in a day.	Number of days.					Total.	Daily Mean.	Per cent.
	A. Max.	B. Min.	Mean of A and B.	Highest Max.	Lowest Min.	Lowest Max.	Highest Min.	At 1 foot	At 4 feet			Amt.	Precipitation .01 in or more	Precipitation, .04 in or more	Thunder-storm	Fog morning obs.	Gale force 8 or more			
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	in.						Hrs.	Hrs.	
Railway Hill, Kuala Lumpur, Selangor ...	92.0	71.9	81.9	96	68	85	75	84.8	85.2	12.41	315.2	3.85	14	11	3	7	1	206.10	6.65	55
Bukit Jeram, Selangor ...	88.2	72.5	80.3	91	70	80	75	84.1	86.0	12.87	326.9	3.09	15	13	2			215.25	6.94	57
Sitiawan, Perak ...	88.9	73.3	81.1	92	70	81	76	83.4	84.0	6.66	169.2	1.94	18	14	1	2		196.35	6.33	53
Temerloh, Pahang ...	87.5	71.8	79.7	92	68	78	75	84.1	85.2	8.80	223.5	2.08	20	16		6		170.80	5.51	45
Kuala Lipis, Pahang ...	88.5	71.2	79.9	92	66	78	74	83.3	84.0	7.60	193.1	1.70	16	15		21		178.00	5.74	47
Kuala Pahang, Pahang ...	84.6	74.1	79.3	88	70	78	77	82.8	84.2	20.51	520.9	4.00	25	20			1	177.70	5.73	47
Kallang Aerodrome, S'pore ...	86.7	74.8	80.7	92	72	80	77	82.2	83.6	7.77	197.4	1.48	15	13	13			167.75	5.41	45
Butterworth, Province Wellesley ...	89.0	73.4	81.2	92	70	85	76	86.0	86.0	7.58	192.5	2.27	16	14		1	1	234.50	7.56	63
Bayan Lepas Aerodrome Penang ...	88.8	73.1	80.9	93	69	84	76	84.6	84.9	7.00	177.8	1.79	18	18	7		1	239.05	7.71	64
Bukit China, Malacca ...	88.8	73.5	81.1	93	71	83	75	84.1	84.9	8.27	210.1	1.65	15	13	3		1	205.55	6.63	55
Kluang, Johore ...	87.0	71.3	79.1	92	66	79	73	81.2	81.8	8.13	206.5	1.29	20	17	1	10		159.35	5.14	42
Bukit Lalang, Mersing, Johore	83.6	73.2	78.4	86	68	77	79	80.8	80.9	21.92	556.8	4.07	23	19				168.45	5.43	45
Alor Star, Kedah ...	92.2	71.2	81.7	95	65	86	74	84.6	85.1	9.47	240.5	2.46	13	12	8	1		243.00	7.84	65
Kota Bahru, Kelantan ...	86.8	72.8	79.8	90	68	79	75	82.5	83.3	5.19	131.8	1.02	20	18	1	1		210.80	6.80	57
Kuala Trengganu, Trengganu	86.1	72.9	79.5	89	68	76	76	82.7	83.7	12.27	311.7	3.43	27	24		2	1	206.50	6.66	55
HILL STATIONS.																				
Fraser's Hill, Pahang 4268 ft.	71.7	61.7	66.7	75	59	64	64	72.5	72.1	8.00	203.2	1.26	24	23		24		165.20	5.33	44
Cameron Highlands, Tanah Rata, Pahang 4750 ft. ...	73.3	56.0	64.7	77	44	65	63	69.0	69.1	5.46	138.7	0.93	13	12				161.00	5.19	43
Cameron Highlands, Rhododendron Hill, Pahang 5120 ft. ...	71.8	58.7	65.3	76	56	63	61			5.56	141.2	0.99	13	13	2		2	173.35	5.59	46

Compiled from Returns supplied by the Meteorological Branch, Malaya